MARCH 1989

DRAFT 1988

AIR QUALITY MANAGEMENT PLAN

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

scag

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

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PREFACE

The 1988 Air Quality Management Plan (AQMP) represents the culmination of nearly 5 years of study to update the regional plan for attaining clean air in the South Coast Air Basin. Over 45 interim reports and approximately 5,500 pages of evaluation and analysis have been published during this effort. Some of the more notable interim reports are: Long-Range Strategies for Improving Air Quality (September 1985), Short-Range Control Measures Under Development (November 1986), Path to Clean Air: Attainment Strategies (December 1987), Path to Clean Air: Policy Proposals (June 1988).

Public input has resulted in the development of a Plan that seeks to balance the interests of each sector, while holding to the basic goal of attaining clean air within the next twenty years. The last fifteen months represent the most extensive public review process that has been seen on any major plan for this region. During this time, various components of the Plan have been modified in response to public comments. This publication represents the fourth set of revisions to the Plan. All prior modifications are incorporated into this final draft.

The changes to the Plan which have been made since the December 16, 1988 District Board hearing are summarized below.

- Chapter 1-- Clarification of the process following Plan adoption was added, including: a schedule for the next update of the Plan, the establishment of Task Forces and Working Groups, and notice that each subsequent District rule is subject to both environmental and economic assessment.

- Chapter 4-- The term "clean fuels" or "alternative fuels was revised to "low emitting technologies" in Tier II and to "extremely low emitting technologies" in Tier III to ensure the flexibility for inclusion of all technologies capable of achieving the required emission reductions.

- Chapter 4-- Page numbers of AQMP appendices were added to easily identify control measures on select tables.

- Chapter 4-- Tier I emission reductions between stationary and mobile sources were corrected in Table 4-1.

- Chapter 6-- Page numbers of AQMP appendices were added to easily identify control measures on select tables.

- Chapter 6-- Responsibilities for proposed State and Federal control measures were clarified, along with a recognition of the portion of the total emissions that are subject to Federal regulation.

- Summary of Appendices-- This new section was added to provide a brief summary for each appendix to the Plan and is located after Chapter 6.

- Appendix IV-A, Tier I and II Control Measures-- Seven control measures were revised. Four of the key measure modifications are: (1) disincentives on industrial relocation will be removed from the New Source Review Rule in order to facilitate job/housing balance; (2) landfill and digester gas-fueled IC engines will not be subject to the proposed substitution of electric motors; (3) rail haul of solid waste out of the Basin will be contingent on rail electrification; and (4) pool, residential and commercial water heating may use other controls than solar equipment provided that equivalent NOx reductions are demonstrated.

- Appendix IV-G-- SCAG's "Summary of Changes to Draft Appendix IV-G" published in December 1988 was added. The SCAG's Regional Mobility Plan and Growth Management Plan were adopted on February 2, 1989.

The above changes or additions are shown in italics within the document.

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1988 DRAFT AIR QUALITY MANAGEMENT PLAN

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EXECUTIVE SUMMARY

BACKGROUND

The South Coast Air Basin, which comprises all of Orange County and the non-desert portions of Los Angeles, Riverside and San Bernardino Counties, has the worst air quality problem in the nation. Despite having put into place many strict controls, the Basin still fails to meet the federal air quality standards for four of the six criteria pollutants.

The Basin is in compliance with federal standards for sulfur dioxide and lead. But the maximum ozone concentrations here reach about three times the federal health standard. Carbon monoxide and fine particulate matter (PM10) reach maximum levels of twice the federal standard. And the Basin is the only area in the country that still fails to meet the nitrogen dioxide standard.

The Basin's first Air Quality Management Plan (AQMP) was adopted in 1979. It contained an early action plan that emphasized control measures which had been targeted by the federal Environmental Protection Agency (EPA) and the state Air Resources Board (ARB) as having high priority for implementation. The Plan also requested an extension until 1982 for submittal of a revision that would address attainment of the carbon monoxide and ozone standards.

With the better data and modeling methods available for the 1982 Revision of the AQMP, it became apparent that the Plan could not demonstrate attainment by the 1987 deadline required by the federal Clean Air Act. Therefore, the 1982 AQMP Revision proposed a long range strategy that could result in attainment in 20 years. In 1987, a federal court ordered the EPA to disapprove the 1982 AQMP Revision because it did not demonstrate attainment by the 1987 deadline.

PURPOSE OF THE 1988 REVISION OF THE AIR QUALITY MANAGEMENT PLAN (AQMP)

The purpose of the 1988 Revision of the AQMP is to set forth a comprehensive control program that will lead the South Coast Air Basin into compliance with all federal and state air quality standards. This goal has been set by the Board of Directors of the South Coast Air Quality Management District (the District) and the Executive Committee of the Southern California Association of Governments (SCAG).

In 1988, the District Board adopted a policy calling for attainment of all the federal and state health standards at the earliest practicable date, but no later than:

December 31, 1996 for nitrogen dioxide,

December 31, 1997 for carbon monoxide,

December 31, 2007 for ozone and PM10.

The AQMP includes interim goals for ozone and PM10 to be met by the year 2000. For ozone, the interim goal is to reduce maximum concentrations to no higher than the Stage I emergency episode level (0.20 ppm), and to reduce the average per capita exposure to ozone levels above the federal standard by 70 percent compared to 1985. For PM10, the interim goal is to attain the federal standards.

The District is responsible for completing the overall AQMP, with major elements contributed by SCAG and the California Air Resources Board. SCAG is responsible for developing regional plans for transportation management, growth and land use. These plans each include strategies that contribute to air quality improvement, and are included in the AQMP. The California Air Resources Board is responsible for developing mobile source control measures, such as vehicle emission standards and fuel specifications.

Once the 1988 AQMP Revision is adopted locally, and approved by the California Air Resources Board, it will *become* the framework for all future air pollution control efforts in the South Coast Air Basin. *Those portions of the plan, necessary to meet Clean Air Act requirements, will become part of* the State Implementation Plan (SIP) revisions. *This will include rules and*

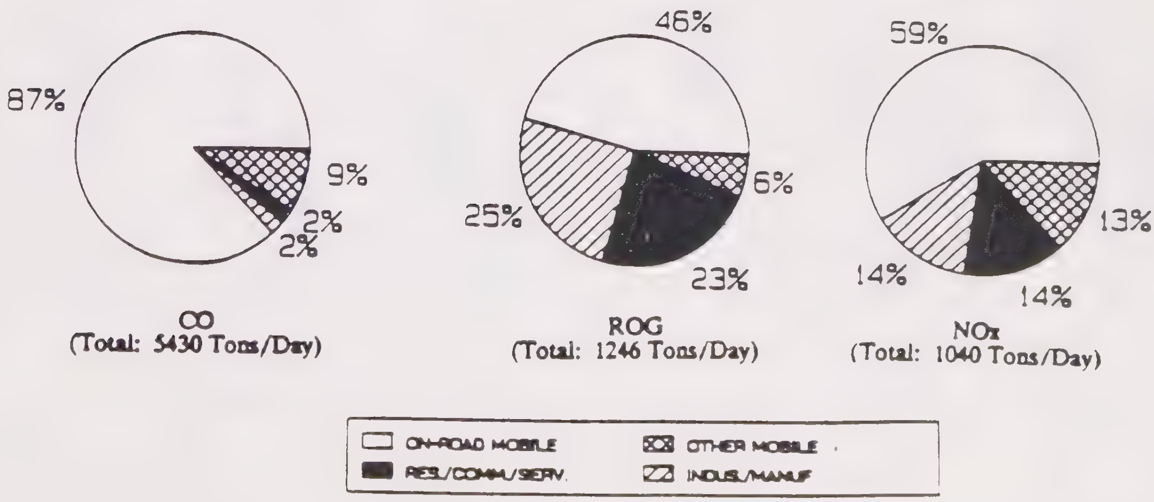
regulations which have already been adopted, along with commitments to study, adopt, and implement many other measures. These commitments, where definite enough to be legally enforceable, should be able to receive full EPA approval. Finally, the AQMP contains a number of measures which need additional specificity, detail, and commitment. Approval of all such measures by the EPA may not be possible, and the plan contains commitments to pursue the additional steps needed to further develop these measures so full approval can be obtained. The ARB will request that EPA approve and include in the SIP commitments of the District, SCAG, and ARB to complete the activities identified that will make timely implementation of the remaining measures possible.

SOURCES AND QUANTITIES OF EMISSIONS

Figure 1 shows the relative contribution of certain emissions from each of the major categories of sources during 1985, the baseline year used to represent the current situation. For some pollutants, such as carbon monoxide, the emissions are overwhelmingly due to mobile sources -- primarily cars, trucks and buses. For other pollutants, such as reactive organic gases and oxides of nitrogen (the precursors of ozone), the sources of emissions are more diverse.

Figure 1

Relative Contribution By Stationary And Mobile Sources to 1985 Emissions



The Basin's air quality problem cannot be solved by controlling any one category of sources. For example, Table 1 shows the 1985 emissions of ozone precursors (ROG and NOx) for each of the categories. Even if the emissions from any two of these categories were totally eliminated, substantially more controls for the remaining two would be required to achieve the reductions necessary to attain the ozone standard.

TABLE 1

Emissions of Ozone Precursors in 1985
(tons/day)

	ROG	NOx
Residential/Commercial/Services	280	142
Industrial/Manufacturing	310	144
On-Road Mobile Sources	578	619
Other Mobile Sources	78	135
Total emissions in 1985	1,246	1,040

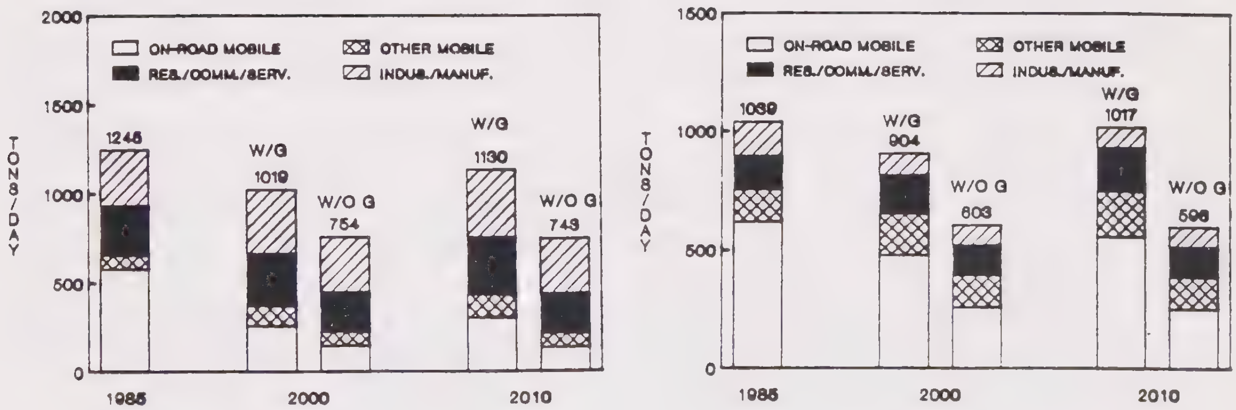
FUTURE AIR QUALITY WITH NO ADDITIONAL CONTROLS

The years 2000 and 2010 were selected to be the baselines for emissions forecasts. These forecasts were derived using the 1985 emissions data, adjusting them for the projected growth, and assuming full implementation of all rules of the District and the ARB that were adopted prior to December 31, 1987.

The forecasts show a reduction in emissions of most pollutants by the year 2000. But, by 2010, emissions are predicted to rise nearly as high or higher than the 1985 levels. Figure 2 shows this pattern for reactive organic gases and oxides of nitrogen. This resurgence in emissions is due entirely to the impact of growth, with two-thirds of this growth due to natural increases (births over deaths) rather than people moving in from other areas. Almost all the emission reductions expected over the next few years as a result of the rules currently in effect will be lost to the impact of the projected 37 percent increase in population and the related increases in jobs, housing and traffic shown in Table 2.

FIGURE 2

Emissions With and Without Growth



ROG NOx

TABLE 2

Socio-Economic Growth Forecasts
for the South Coast Air Basin

Comparison of the year 2010 to the year 1985

Population	37% increase
Housing Units	46% increase
Total Employment	47% increase
Vehicle Miles Traveled	68% increase
Vehicles In Use	35% increase
Vehicle Trips	40% increase

Controlling growth alone, however, will not solve the Basin's air quality problem. Even if no future growth were assumed, the emission reductions expected by the year 2010 as a result of existing rules would not be nearly enough to bring the Basin into compliance with the air quality standards for ozone, PM10 and carbon monoxide.

Forecasts for the year 2010 show that the distribution of emissions throughout the Basin will change over the years, with a significant decrease in emissions in the western part and an increase in the eastern part. Computer modeling was used to estimate the effect this distribution would have on air quality. Even though the Basin's total emissions of ROG and NOx are nearly the same in the year 2010 as they were in 1985, the resulting ozone distribution is very different. Modeling predicts that there would be large scale (0.11 ppm) reduction in the ozone concentrations in Los Angeles and Orange counties, but a corresponding scale of deterioration in the inland areas. The peak ozone concentration would be reduced by 0.06 ppm and the affected area would shift eastward and would be larger.

THE ATTAINMENT STRATEGY

In developing the AQMP, all the potential control measures that could be available by the year 2007 were identified and, to the extent possible, their emission reductions were quantified. These control measures were categorized into three tiers, based upon their readiness for implementation.

Tier I - Full implementation of known control technologies and management practices.

Tier I controls are those that can be adopted within the next five years using currently available technological applications and management practices. Tier I control measures, summarized in Table 3, are expected to be adopted by the appropriate implementing agency by 1993. *Full implementation of some measures, such as new vehicle controls and transportation facility constructions, will not occur until 2007.*

The total estimated cost for the Tier I measures that have cost data is about *$7.2* million per day. This represents an average cost of about *60* cents per day for each resident of the Basin. *Improved technology may reduce the costs.* On the other hand, the estimated air quality benefit maybe as high as *$1.6* per day per capita.

Computer modeling has indicated that Tier I measures will bring the Basin into compliance with the federal standards for carbon monoxide and nitrogen dioxide. Additional control measures are needed to meet the PM10 and ozone standards.

Tier II- Significant advancement of today's technological applications and vigorous regulatory intervention.

Tier II measures include already-demonstrated control technologies *and "on-the-horizon" technologies that* require advancements that can reasonably be expected to occur in the near future. These advancements will be promoted through regulatory action, such as setting standards at levels that force the advancement of existing technology, or establishing a system of emission charges that provide an economic incentive to reduce emissions. *The plan*

commits the Districts, SCAG, the ARB, and other adopting agencies to a comprehensive list and timetable of actions that are essential to successful implementation.

Tier II measures mainly focus on transportation sources and the use of coatings and solvents. Tier II measures and goals are summarized in Table 4. All the Tier II goals are expected to be achieved by 2000 except for transportation facility construction which may continue until 2007.

Computer modeling indicates that the combination of Tier I and Tier II controls will bring the Basin into compliance with the federal, but not the state, standard for PM10.

To meet the state standard for PM10, and the state and federal ozone standards, additional controls beyond Tier II will be required.

Tier III - Development of New Technology

Tier III programs are designed to bring about major technological breakthroughs to further reduce emissions of reactive organic gases. Unlike the first two tiers, TIer III *requires commitments to* research, development, and widespread commercial application of technologies that may not exist yet, but may be reasonably expected given the rapid technological advances experienced over the past 20 years. *The AQMP contains commitments on the part of the District, SCAG, and ARB to the near term (next five years) actions that must be accomplished to realize the emission reductions in Tier III. Annual reports and the next revision of the AQMP will assess the success of these activities, and identify more specific Tier II and III measures.*

Although no specific control measures can be summarized for Tier III, the programs included in this tier are directed primarily at further reducing ROG emissions from solvents and coatings, and from motor vehicles.

Possible Tier III control strategies for solvents and coatings include further improvement in water-based products, ultraviolet-curable coatings, two-component coatings, and non-reactive solvents. These strategies, along with the prohibition of certain coating processes, offer the promise of almost complete elimination of ROG from solvents and coatings.

With respect to *low emitting* vehicles, recent progress in fuel cells, solar cells, storage batteries, and superconductors offer the promise of eliminating combustion processes from motor vehicles almost entirely.

If sufficient technologies to achieve the standards are not identifiable by the mid-nineties, *contingency measures, such as holding VMT to 1985 levels, emission charges and highway user fees will be pursued.*

Modeling indicates that a further 90 percent reduction of ROG from solvents and coatings, and total conversion of the vehicle fleet to *low emitting technologies*, can bring the Basin *into virtual attainment of* the federal ozone standard.

There is some uncertainty in the ozone model at low ozone concentrations. This uncertainty, along with the inability to predict the future for technology that does not yet exist, must be taken into account when trying to determine the possible air quality improvement associated with Tier III. Further study will be required to determine if, or how much, additional control will be necessary to meet the federal and state ozone standards.

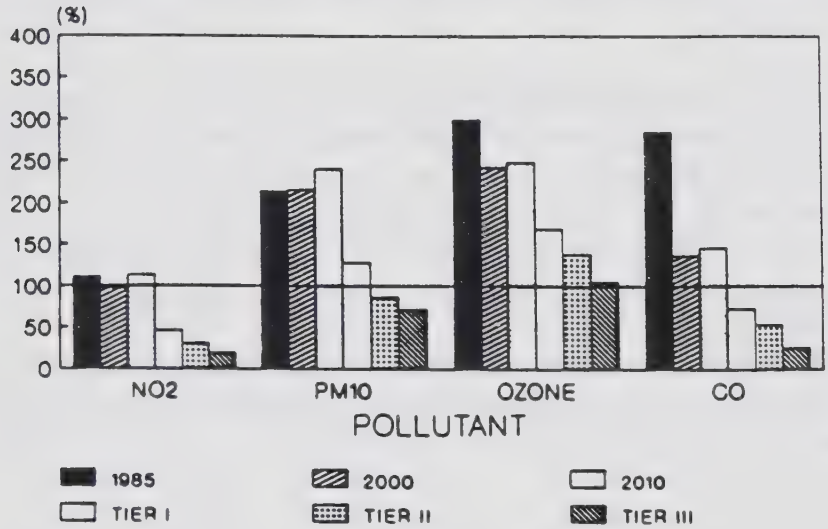
Modeling indicates that to meet the state standards for PM10 and ozone, we will require further *emission reductions beyond those envisioned in Tiers I, II, and III.*

PREDICTION OF AIR QUALITY IMPROVEMENTS

The air quality improvements predicted as a result of each of the three tiers of the attainment strategy are shown in Figure 3.

Figure 3

Projection of Future Air Quality in the South Coast Air Basin in Comparison with the Most Stringent Federal Standards



To estimate the degree of air quality improvement expected before Tier III measures are put into effect, an evaluation was made for the year 2000, assuming maximum implementation of the control measures in Tiers I and II. The results are:

1. Compliance with all federal and state standards for carbon monoxide,

2. Compliance with all federal and state standards for nitrogen dioxide,

3. Compliance with the federal annual and 24-hour average PM10 standard, but without any safety margin,

4. Basinwide peak 24-hour average PM10 concentrations would be about 2.4 times the state standard, and the annual average PM10 concentration would be about 1.5 times the state standard,

5. Peak ozone concentrations will be lowered to the level of the Stage I Episode (0.20 ppm),

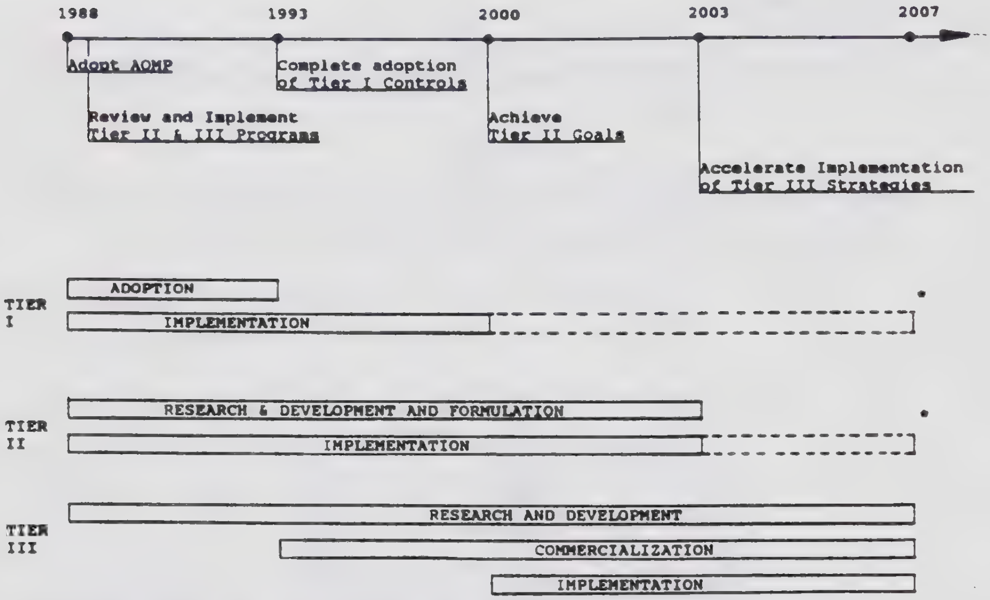
6. *The Basinwide average per capita exposure to ozone levels above the federal standard during the worst episode will be lowered about 90 percent from the 1985 average.*

SCHEDULE FOR IMPLEMENTATION OF ATTAINMENT STRATEGIES

The schedule for implementation of each tier of the attainment strategy is shown in Figure 4. The milestone for complete adoption of Tier I control measures is 1993. Tier II goals for emission reduction are expected to be achieved by 1998.

FIGURE 4

Attainment Strategy Timetable



* Activities related to transportation facility construction will continue until 2007.

Achieving the Tier III emission reduction goals depends largely on research and technological breakthroughs that may reasonably be expected to occur during the next two decades. But actual implementation of Tier III measures is projected to begin as the Tier II goals are achieved in 1998. The Tier III measures will then be implemented on an accelerated schedule intended to achieve attainment by the year 2007.

Progress toward attainment will be tracked in annual status reports to the District Board. Additional control measures will be proposed, or others advanced, as necessary or appropriate.

RESPONSIBILITY FOR IMPLEMENTATION OF ATTAINMENT STRATEGIES

Tier I control measures can be implemented by existing agencies using their existing authority. The priority for each measure's implementation is based on the following criteria:

Potential for reducing emissions

Time required for implementation

Technical and legal readiness for implementation

Cost effectiveness of control

Availability of financing

Short term benefit in relation to long term goals

Number of years benefit would accrue

Based upon the above criteria, the responsible implementing agencies, the adoption dates, and the associated activities have been identified.

Tier II control measures are primarily extensions of Tier I measures, but with more stringent requirements. Tier II goals are heavily dependent on research and development to facilitate their commercial application and widespread use. The technology advancement and demonstration projects needed to *meet* the Tier II goals are *identified* along with the responsible agencies and the time frames for *achieving implementation.*

The District will be responsible for implementing most measures related to stationary sources. Growth management measures will be the primary responsibility of local governments, but there may be some involvement with such regional organizations as SCAG and the District. Local transportation commissions, along with Caltrans, will be responsible for improvements to transportation infrastructure. Further controls on motor vehicles, *consumer products and utility equipment,* are the responsibility of the ARB with the assistance of the District. *The Tier II measures involving low-emitting technologies will be the joint responsibility of the District, the ARB, and the California Energy Commission.*

In some cases, regulatory actions such as technology-forcing standards, emission charges, and growth-management measures will be needed to bring about the technology necessary to achieve Tier II goals. The regulatory actions that require legislation along with the responsible agencies have been provided.

The achievement of Tier III *will require the combined efforts of* the District, *the state agencies (*Air Resources Board, *California Energy Commission, and Caltrans)* and local and regional transportation and planning agencies.

TABLE 3
SUMMARY OF TIER I CONTROL MEASURES

Controls on the use of coatings and solvents

Twenty-two control measures such as using low VOC paints and solvents, higher transfer efficiency methods for applying coatings and controlling fumes from coating operations. Also, reducing emissions from consumer products such as aerosol sprays and underarm deodorants.

Controls on the production, refining, and distribution of petroleum and gas

Fifteen control measures to control emissions from refinery heaters and boilers, oil field steam generators, valves, pumps and compressors, and improve vapor recovery systems.

Controls on industrial and commercial processes

Ten control measures such as reducing emissions from small sources which are exempt from existing rules, controlling emissions from boilers and internal combustion engines.

Controls on residential equipment and public services

Ten control measures such as reducing nitrogen oxide emissions from water heaters and furnaces, controlling fugitive emissions from publicly-owned wastewater treatment plants, controlling dust from roads and parking lots, and transporting solid wastes out of the Basin for disposal.

Controls on agricultural sources

Three control measures to reduce reactive emissions from pesticide applications, ammonia from livestock wastes, and fugitive dust from farming operations.

Controls on other stationary sources

Eleven control measure such as requiring use of Best Available Retrofit Control Technology for all existing sources, tightening requirements for New Source Review, requiring low-emission materials for building construction, and phasing out use of fuel oil and coal by stationary sources.

TABLE 3 (Continued)
SUMMARY OF TIER I CONTROL MEASURES

Controls on motor vehicles

Nineteen control measures such as requiring stricter emission control standards for new vehicles, clean fuels for fleet vehicles, improved inspection and maintenance programs and controls on diesel powered buses and trucks.

Controls on transportation systems and land use

Twenty control measures to reduce vehicle use, improve traffic low, improve public transit, and manage growth.

Control on other mobile sources

Thirteen control measures such as reducing emissions from aircraft, ships, locomotives, construction equipment, pleasure boats and off-road motorcycles.

TABLE 4

SUMMARY OF TIER II CONTROL MEASURES AND GOALS

40 percent of the passenger vehicles and 70 percent of the freight vehicles to be operated *by low emitting vehicle technologies*. All diesel-powered transit buses switched to *low emitting vehicles.*

Reducing the remaining emissions from other mobile sources (aircraft, ships, locomotives, construction equipment) by 50 percent.

Reducing the remaining ROG emissions from solvents and coating by 50 percent.

Reducing the remaining ROG emissions from consumer products by 50 percent.

Minimizing potential increases in emissions from existing and *new* stationary sources.

CHAPTER 1

INTRODUCTION

Purpose
Extent of the Air Pollution Problem
Constraints in Achieving Standards
Control Efforts
Authority for Current Air Quality Planning
Previous Air Quality Management Plans
1988 AQMP Revision

PURPOSE

The purpose of the 1988 Revision to the Air Quality Management Plan (AQMP) for the South Coast Air Basin is to set forth a comprehensive program that will lead the Basin into compliance with all federal and state air quality standards. This goal has been set by the Board of the South Coast Air Quality Management District (SCAQMD) and the Executive Committee of the Southern California Association of Governments (SCAG).

At its January 1988 meeting the SCAQMD Board adopted a District policy which calls for attaining federal and state ozone and PM10 health standards at the earliest practicable date, but no later than December 31, 2007. For nitrogen dioxide and carbon monoxide the deadlines for attaining federal and state standards are as early as practicable, but no later than December 31, 1996 and December 31, 1997, respectively.

Interim goals are proposed for the AQMP for the year 2000 for ozone and PM10. For ozone, the interim goal is to reduce maximum concentrations to no higher than the Stage I emergency episode level (0.20ppm) and reduce exposure by 70 percent. For PM10, the interim goal is to attain the federal standards.

Adoption of the AQMP by the District, SCAG and the ARB commits these agencies to an extensive list of regulatory, research and other activities needed to implement the measures contained in the AQMP. Where the measures involve currently technically feasible controls which the District or ARB have existing legal authority to adopt, the Plan commits each agency to design, adopt, and implement the measure, or an equally effective set of substitutes, on the schedule contained in the AQMP. Where measures involve transportation or growth decisions for which SCAG has lead responsibility, inclusion of a measure commits SCAG, with the assistance and support of the AQMD, to obtain the legal commitments needed to implement the adopted measures.

Many measures in the Plan require actions by local, state or federal agencies that have not adopted or made a commitment to adopt (and are therefore not bound by) the AQMP. Others require modifications in federal or state laws or the advancement of technology beyond what is known to be feasible today. Inclusion of these measures in the AQMP commits the District, SCAG and the ARB to

initiate and promote the activities that will result in timely adoption and implementation of these measure. This will involve the design, introduction and promotion of legislative proposals, creation of programs to work with local, state and federal agencies to gain commitment to measures, working with industry and funding research to advance technology and, finally, building public support so that the measures needed for attainment are understood, accepted and supported. Finally, the District, SCAG and ARB have the opportunity to revise or replace control measures to reflect the most current analysis of control feasibility and effectiveness.

Because of the uncertainties in advancing technology, obtaining changes in existing law and securing the full, legally enforceable support of hundreds of local, state and federal agencies, neither the District, SCAG nor the ARB can guarantee the adoption and implementation of all measures in the Plan. To ensure progress is made, annual reports on the status of all measures contained in the Plan will be prepared. The annual reports will indicate the success or problems with adopting measures, advancing technology, obtaining needed commitments, modifying state and federal laws in generating public support.

After the adoption of the Plan, the following actions will be taken:

1. *One regional Task Force will be established to develop implementation strategies for the Growth Management and Transportation measures;*

2. *A regional Task Force will be established to assist in the next phase of the Socio-Economic research on both public health benefits and the impacts of specific rules;*

3. *Three Working Groups will be established to enhance technical consensus on: modeling, energy issues, and monitoring/conformity;*

4. *Through the Task Forces, the Working Groups, ARB's and EPA's review of the Plan, work will begin on the development of any necessary amendments to the Plan;*

5. *In compliance with the California Clean Air Act, the next update of the Plan will be prepared by December 1990; and,*

6. *Each District proposed rule will be subject to both an environmental and an economic assessment.*

The District shall also develop modifications to this Plan over the next two years to include new measures to achieve additional emission reductions. Furthermore, to ensure that all potentially viable measures are considered in a timely fashion, the District and SCAG will work with the ARB and EPA to develop common methods of analyzing cost-effectiveness and technical feasibility before the next AQMP revision. If possible, a joint agreement will be reached on guidelines for these terms and will be used by each agency in their respective rulemaking processes. These terms, however, need not be considered by these agencies as the only criteria in determining adoption of a particular rule.

Finally, in its development of the next AQMP revision, the District will review the effects of electrification strategy (i.e., potential increase in power demand), analyze the implications for global warming, acid deposition, visibility, toxic, and other national and global environmental concerns.

EXTENT OF THE AIR POLLUTION PROBLEM

Both the federal and state governments have set health-based ambient air quality standards for the following six pollutants: sulfur dioxide, lead, ozone, nitrogen dioxide, carbon monoxide, and fine particulate matter. These standards are designed to protect the most sensitive persons from illness or discomfort with a margin of safety. The Basin complies with standards for the first two, but exceeds standards for the other four.

In addition, California has set standards for ethylene, hydrogen sulfide, sulfates, visibility, and vinyl chloride. All but sulfates and visibility are primarily localized problems, and are handled through permit requirements. Sulfates and visibility are addressed through control programs for the four pollutants described below.

Carbon Monoxide (CO)

Formed by incomplete combustion of fossil fuels, carbon monoxide is caused almost entirely by automobiles. Carbon monoxide can cause dizziness and fatigue, and can impair central nervous system functions.

Carbon monoxide concentrations in the Basin are among the highest in the nation, and are about two times higher than the federal and state standards. Exceedances of the federal standard occurred on more days than in any other area of the country in 1985 except New York City.

Nitrogen Dioxide (NO_2)

Nitrogen oxides are contributors to other pollution problems, including high concentration of fine particulate matter, poor visibility, and acid deposition. Nitrogen dioxide decreases lung function and may reduce resistance to infection. Although the federal nitrogen dioxide standard was exceeded by only 2 percent in 1987, the South Coast Air Basin is the only region in the United States that has not attained the standard.

Nitrogen dioxide and nitric oxide are formed as a result of fuel combustion under high temperature or pressure; together these compounds are referred to as nitrogen oxides or NOx.

Ozone

Ozone is formed by photochemical reactions between directly emitted NOx and reactive organic gases (ROG). ROG is formed from combustion of fuels and from evaporation of organic solvents. Elevated ozone concentrations result in reduced lung function, particularly during vigorous physical activity. This health problem is particularly acute in children.

Ozone levels in the South Coast Air Basin are approximately three times the federal standard. They are significantly higher than anywhere else in the nation, and in 1985 exceedances of the standard occurred nearly four times as often as in the next highest area.

PM10

PM10 refers to small suspended particulate matter, 10 microns or less in diameter, which can enter the lungs. Nitrates and sulfates, as well as dust particles, are major components of PM10. These small particles can be directly emitted into the atmosphere as a by-product of fuel combustion; through abrasion, such as wear on tires or brake linings; or through wind erosion of soil. They can also be formed in the atmosphere through chemical reactions. The particles may carry carcinogens and other toxic compounds, which adhere to the particle surfaces and can enter the lung.

The annual average PM10 concentrations in the South Coast Air Basin was about 80 percent above the federal standard in 1987.

CONSTRAINTS IN ACHIEVING STANDARDS

Setting

The South Coast Air Basin is a 6600 square mile area bounded by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto mountains to the north and east. The Basin includes all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino counties.

The topography and climate of Southern California combine to make the Basin an area of high air pollution potential. During the summer months, a warm air mass frequently descends over the cool, moist marine layer produced by the interaction between the ocean's surface and the lowest layer of the atmosphere. The warm upper layer forms a cup over the cool marine layer and inhibits the pollutants in the marine layer from dispersing upward. In addition, light winds during the summer further limit ventilation. Sunlight also is needed for the photochemical reactions which produce ozone. The region experiences more days of sunlight than any other major urban area except Phoenix.

Emission Sources

Air pollution forms either directly or indirectly from pollutants emitted from a variety of sources. These sources can be natural, such as oil seeps, vegetation, or wind-blown dust. Emissions may also result from combustion, as in automobile engines; from evaporation of organic liquids, such as are used in coating and cleaning processes; or through abrasion, such as from tires on roadways. The air pollution control strategy in the AQMP is directed almost entirely at controlling man-made sources since they are the most easily controlled. Where naturally occurring emissions can be mitigated, such as through windbreaks, they are included. Otherwise, natural emissions are accounted for in the background and initial conditions data used for the air quality models described in Chapter 5.

The Basin's industrial base is diverse. The aerospace and electronics industries currently account for about 20 percent of the Basin's employment.

Significant changes have occurred in the composition of the industrial base of the region in the past ten years. As in many other areas of the country, a large segment of heavy manufacturing, including steel and tire manufacturing and automobile assembling, has left. Small service industries and businesses resulting from growth in shipping and trade have replaced much of the heavy industry.

Population

Since the end of World War II, the Basin has experienced faster population growth than the rest of the nation. Although growth is slowing somewhat, this region continues to project a significant increase in population by 2007, as shown in Table 1-1. Projected growth is based on SCAG's Draft Baseline Projection.

TABLE 1-1

Population Growth

Year	Population	Average %Increase Per Year Over Period
1950	4.8 million	
		2.7%
1980	10.5 million	
		1.5%
1985	11.3 million	
		1.3%
2010	15.5 million	

Although per capita emissions have been brought down substantially in the Basin through 40 years of controls, increases in the population over that time have made substantial emission reductions more difficult. Many sources, such as automobiles, have been significantly controlled. However, increases in the number of such sources, particularly those growing proportionately to population, reduce the potential air quality benefits of new controls.

CONTROL EFFORTS

History

The seriousness of the local air pollution problem was recognized in the early 1940s. In 1946, the Los Angeles County Board of Supervisors established the first air pollution control district in the nation to address the problems of industrial air pollution. In the mid-1950s, California established the first state agency to control motor vehicle emissions. Countywide or regional air pollution districts were required throughout the state by 1970. Many of the controls originated in California became the basis for the federal control program which began in the 1960s.

Nearly all control programs developed to date have relied on development and application of cleaner technology and add-on emission control devices. Sources affected by this technology have been industrial and vehicular. Only recently have efforts been directed at how emission sources are used, e.g. the Inspection & Maintenance Program, HOV Lanes, and mandatory maintenance procedures on industrial sources.

In the 1970s it became apparent at both the state and federal levels that local programs were not enough to solve a problem that was regional in nature and did not stay within jurisdictional boundaries. Instead, air basins, defined by geographical boundaries, became the basis for regulatory programs.

In 1976 the California Legislature adopted the Lewis Air Quality Management Act which created the South Coast Air Quality Management District from a voluntary association of air pollution districts in Los Angeles, Orange, Riverside, and San Bernardino counties. The new agency was charged with developing uniform plans and programs for the region to attain federal standards by the dates specified in federal law. It was also mandated to meet and state standards by the earliest date achievable, using reasonably available control measures.

Impact of Control

Past air quality programs have been effective in improving the Basin's air quality. Although the magnitude of the problem depends heavily on the weather conditions in a given year, and improvements can only be compared for the same air monitoring station, ozone levels have declined by almost half over the past 30 years. However, they remain at or near the top of all pollution concentrations in the country.

AUTHORITY FOR CURRENT AIR QUALITY PLANNING

Lewis Air Quality Act of 1976

The Lewis Act established the four-county South Coast Air Quality Management District and mandated a planning process. In addition to requiring preparation of an Air Quality Management Plan consistent with federal planning requirements, the act also set up a process in which the AQMP was to be reviewed every two years and revised as necessary.

Clean Air Act Amendments of 1977

Prior to the 1977 Amendments, the federal Clean Air Act required that all areas of the country attain the federal ambient air standards by 1975; this deadline was later extended to 1977. The 1977 Amendments again extended

these deadlines, this time to 1982, with an additional extension for ozone and carbon monoxide to 1987.

The Amendments also established local air quality planning processes, requiring separate plans for each local area that had not attained the standards. These plans, called non-attainment plans, were to be prepared by local agencies designated by the governor of each state and incorporated into a State Implementation Plan (SIP). The federal Environmental Protection Agency (EPA) could issue sanction for failure to submit a plan or carry out commitments in a plan. Sanctions could be a ban on construction of major new facilities and the withholding of federal highway, sewage treatment, and air planning funds.

California Clean Air Act of 1988

The state Clean Air Act also known as the Sher Bill (AB 2595) was signed into law on September 30, 1988 and became effective on January 1, 1989. This Bill requires the District to prepare a plan by December 31, 1990 for attaining the state air quality standards. The District plan shall be designed to ensure compliance with the requirements of this bill.

Integration of State and Federal Requirements

State law requires the AQMP to identify how the state and national ambient air quality standards will be achieved and maintained. The AQMP is to be prepared by the District and SCAG and becomes effective upon approval by the ARB. Most of the Plan, those portions that address national ambient air quality standards and are required by the Clean Air Act, are to be submitted by the ARB to EPA as SIP revisions. (State law prohibits including those parts of the Plan that relate exclusively to state standards in the SIP.)

While the Plan intended to address the federal Clean Air Act, that effort is handicapped by the highly fluid and uncertain nature of current federal requirements. While the federal act as a whole remains in effect, many of its provisions are subject to reinterpretation now that the 1987 deadline for attaining national standards has passed. The legal interpretations and policies of the EPA are in flux and the courts are engaged in a number of cases of potential relevance. This uncertainty may continue until Congress amends the Act in 1989 or thereafter. For these reasons, it is not possible to design the AQMP with

reasonable assurance that it will meet all Clean Air Act requirements or be fully approved by the EPA.

This uncertainty is of particular concern to the ARB which by law is responsible for including the portion of the AQMP required by the Clean Air Act into the California State Implementation Plan and submitting it to EPA. To accomplish this, the ARB must review AQMP provisions prior to its adoption to determine their adequacy to meet Clean Air Act requirements. In some cases, the ARB will have to exercise its judgement in the absence of clear legal guidelines.

Fortunately, relatively clear federal guidelines do exist with respect to the control measures contained in the Plan. Pursuant to the Clean Air Act, plans must provide assurances that the state will have adequate personnel, funding, and authority to carry out implementation. The EPA has established general criteria for proper adoption, which states must include when submitting State Implementation Plan control measures to the EPA for approval. These criteria are used so that both emission reduction credit and a formal route of "federal enforceability" are ensured. EPA's criteria include requirements for legal authority, binding commitment, specificity, funding, scheduling, approval from appropriate governmental agencies (e.g.. highway departments), and monitoring. The ARB will use these criteria in its consideration of all the control measures contained in the Plan. It is important to note that, under current policy, EPA will consider that the state is not making reasonable efforts to develop an adequate plan if the state and local agencies fail to carry out their adoption process with respect to the Plan's measures. This could subject the area to highway funding sanctions and, possibly, sewage treatment funding limitations authorized under the Clean Air Act.

Under current EPA legal interpretations, at least a part of the Plan would be disapproved because it does not demonstrate attainment of the ozone and carbon monoxide standards within five years. In addition, the EPA is under court order to prepare a federal implementation plan (FIP) for the region which EPA would like to base on the AQMP. Under current EPA policy and legal interpretations, however, the FIP would have to contain a number of extreme measures which are not in the AQMP. While the Plan would significantly increase the extent to which the region complies with the Clean Air Act, it cannot resolve all federal problems.

These facts, combined with the inability of the ARB, the District, and SCAG to guarantee implementation of all Tier II and Tier III measures, suggest that EPA may not be able to approve every measure included in the AQMP. In recognition of this situation, it is expected that after adoption of the Plan by the District and

ARB, the AQMP will be submitted to the EPA. Full SIP approval will be sought for those measures that meet EPA requirements for legal enforceability, and for any legally enforceable commitments that will make the implementation of the remaining measures possible. This will include commitments to study and adopt individual measures. EPA acceptance of commitments to pursue the remainder of the measures (i.e. those which are currently unenforceable or too ill defined to receive emission reduction credit) will also be sought.

PREVIOUS AIR QUALITY MANAGEMENT PLANS

1979 AQMP

The 1979 AQMP was initiated under Lewis Act requirements and modified to fit federal requirements. Because the South Coast Air Quality Management District was not organized until early 1977 and the federal requirements called for an adopted SIP in early 1979, planning time was very limited. Therefore, the first AQMP focused on building a data base from the divergent records of the predecessor agencies and on building conformity of projections with other regional plans being prepared by the Southern California Association of Governments. It contained an early action plan, emphasizing measures which had been targeted by the EPA and the Air Resources Board as high priority, and requested an extension to submit an AQMP Revision for ozone and carbon monoxide in 1982.

1982 AQMP Revision

As with the 1979 AQMP, the 1982 AQMP Revision set an agenda for short-term implementation, and committed to fulfilling policies adopted by the boards of the planning agencies and carrying out a continuing planning process.

Using better data and modeling tools that were made available for this effort, the 1982 AQMP Revision concluded that the region could not meet the 1987 attainment deadline. It stated that new approaches and new ways of assessing the problems were required. Consequently, the 1982 AQMP Revision proposed a long range strategy that could result in attainment in 20 years. This strategy consisted of three main components: Alternative Energy

Sources, Modifications to Transportation and Urban Form, and Advanced Technology, particularly in the areas of non-reactive solvents and surface coatings. Through the continuing planning process, these categories were to be studied, promoted where feasible, and brought back for recommended action in future revisions to the AQMP.

In 1987, the federal court ordered EPA to disapprove the 1982 AQMP Revision because it did not demonstrate attainment of the federal standards by 1987 as required by the Clean Air Act.

Reduction Shortfalls

Short-term emission reductions estimated in the 1982 AQMP Revision have not been realized to the extent predicted. Among the reasons are:

Greater than anticipated population growth;

Greater growth of small industrial sources not subject to offsets under the District's New Source Review Rule;

More abundant and cheaper gasoline supplies leading to increased driving;

Measures not as effective as originally estimated;

Failure to adopt some measures identified in AQMP.

1988 AQMP REVISION

Preliminary Planning

Work has been underway on the 1988 AQMP Revision since 1982, beginning with development of a comprehensive new emissions inventory. A series of working papers were issued which address potential control measures, concentrating on those that use new approaches or advanced new technology.

Long Range Strategy Paper. Issued in 1985, this paper further refined the Long Range Strategy section of the 1982 AQMP Revision. Solvent

substitution and new methods of application were key components, as were further advancement of methanol and electrification as an alternative to conventional fuels. This information was the basis for many of the programs now being promoted by the District's Office of Technology Advancement.

Working Paper No. 4--Short Range Control Measures. Issued in late 1986, this paper was a comprehensive listing of control measures available for implementation in the next five years. It included economic incentives and transportation measures. Also included was an identification of areas where additional authority would be required to implement the measures. Much of the authority granted by the Presley Bill (SB 151) of 1987 was identified in this paper. Working Paper No. 4 also served as the basis for the District's Early Action Plans of 1987 and 1988 which consisted of measures identified as available for immediate rule adoption.

Attainment Strategies

Path to Clean Air: Attainment Strategies. This paper, issued jointly by SCAG and the District in December 1987, was designed to stimulate discussion of the measures that would be necessary to reach attainment in 20 years. The "Path" provided an overview of air quality in the Basin, an identification of emission sources, and a review of the types of programs needed to achieve air quality standards.

1988 AQMP Policy Proposals

The Policy Proposals for the 1988 AQMP Revision presented in this document and its appendices refine the measures and inventories previously issued for public comment. They include projections of future air quality after imposition of controls, and include costs where available. The AQMP Policy Proposals address all federal and state pollutants for which standards have not yet been attained. To meet the District attainment policy, the AQMP Policy Proposals call for implementing all technologically available cost-effective measures, adopting procedures which maximize emission reductions, and forcing development of new technology.

Relation to Adjacent Air Basins

The South Coast Air Basin affects adjacent air basins through transport of air pollutants downwind. The downwind areas affected are the Antelope Valley and Coachella Valley, both in the Southeast Desert Air Basin, and the San Diego Air Basin. The South Coast Air Basin both transports pollutants to and receives air pollutants from the coastal portions of Ventura and Santa Barbara counties in the South Central Coast Air Basin. The South Coast Air Basin also receives air pollutants from oil and gas development operations on the outer continental shelf. These AQMP Policy Proposals do not specifically address the control requirements for adjacent areas. However, the control measures in these AQMP Policy Proposals will assist downwind areas in coming into compliance.

Areas upwind of the South Coast Air Basin (primarily Ventura County, but also including Santa Barbara County and the outer continental shelf) will need to reduce emissions to allow those areas to come into compliance with all air quality standards. If the South Coast Air Basin is also to comply, sources in these upwind areas will need to reduce emissions further, i.e., reduce emissions beyond what may be required to achieve the standards in these areas. All analyses in the 1988 AQMP Policy Proposals assume that control measures apply equally to the South Coast Air Basin and upwind areas.

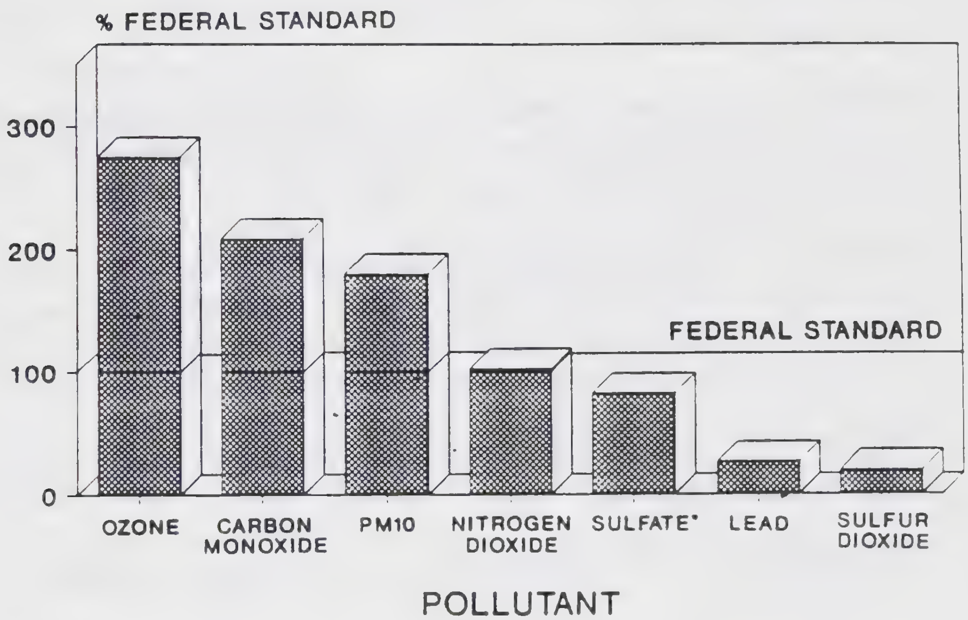
CHAPTER 2

CURRENT AIR QUALITY

Introduction
Summary
Comparison of 1987 Air Quality to Standards

INTRODUCTION

Air pollution levels in the South Coast Air Basin remain high compared to standards set to protect public health. There are six federally-regulated air pollutants. In 1987, four pollutants--carbon monoxide, nitrogen dioxide, ozone, and PM10--exceeded the standards. Lead and sulfur dioxide concentrations met the standards. Figure 2-1 shows the maximum concentrations of each pollutant as a percentage of the federal standards. Sulfate, for which no federal standard exists, is shown as a percentage of the California standard.



* PERCENT OF STATE STANDARD

FIGURE 2-1

1987 Basin Maximum Pollutant Concentrations As Percent Of Federal Standards

SUMMARY

Air quality in 1987 is summarized below:

Carbon monoxide (CO) - Carbon monoxide concentrations exceeded federal and state standards in coastal and central Los Angeles County and in western Orange County. The maximum 8-hour average carbon monoxide concentration was roughly twice the federal standard.

Lead - The federal and state standards were met at all locations.

Nitrogen dioxide (NO_2) - The federal standard was exceeded only in a small area of Los Angeles County, and exceedances of the state standard were limited to Los Angeles and Orange counties. The highest annual average concentration was two percent greater than the federal standard.

Ozone (O_3) - Ozone concentrations exceeded both federal and state standards throughout the Basin. The maximum hourly concentration was nearly three times the federal standard.

PM10 - PM10 concentrations exceeded federal standards in much of the Basin. The more stringent state standards were exceeded everywhere in the Basin. The highest annual average PM10 concentration was 1.8 times the federal standard.

Sulfate - The state standard for sulfate was met throughout the Basin for the first time.

Sulfur Dioxide - The federal and state standards were met at all locations.

Visibility - The state standard for visibility was exceeded at all monitored locations. It was exceeded most frequently in the same general area where the particulate matter concentrations were greatest.

The base year for emissions data and modeling analyses is 1985. Appendix II-A includes a detailed analysis of air quality in 1985, together with statistics for each monitoring location. Tabulations of similar statistics for 1986 are provided in Appendix II-B. Appendix II-C includes detailed trend analyses for 1975 through 1986.

The following section shows where the standards were exceeded in 1987 and how the number of exceedances has changed over time at representative locations. These locations were among those having the highest concentrations or exceeding the standards most frequently. In addition, complete data exists for these monitoring locations for a number of years.

COMPARISON OF 1987 AIR QUALITY TO STANDARDS

Carbon Monoxide

In 1987, the South Coast Air Quality Management District monitored the air for carbon monoxide at 21 locations in the Basin. Federal CO standard exceedances occurred only in Los Angeles and Orange counties; the high area was coastal and central Los Angeles County.

The federal standard was exceeded most frequently at Lynwood (40 days). Lynwood also reported the greatest number of exceedances (47 days) of the state standard (8-hour average CO concentration greater than 9.0 ppm). It was the only location to exceed the federal alert level (8-hour average concentration greater than 15 ppm). The highest 8-hour average carbon monoxide concentration was 19.6 ppm, slightly more than twice the federal standard.

Figure 2-2 shows the percentage of days each year since 1975 on which the federal standard was exceeded at Lynwood, a location representative of the area in coastal and central Los Angeles County where carbon monoxide concentrations are highest. Although relatively large year-to-year fluctuations in carbon monoxide concentration can occur because of weather variations, this effect can be reduced by use of 3-year averages. Comparing two 3-year averages a decade apart shows that the number of exceedances has decreased by 60%, from an average of 95 days for 1976-1978 to 38 days for 1985-1987.

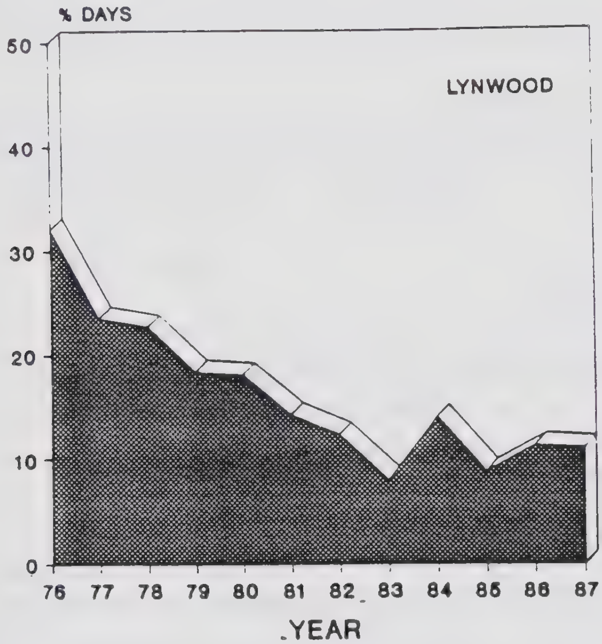


FIGURE 2-2

CARBON MONOXIDE

Percent Days Federal Standard Exceeded, 1976-1987
(8-hour average concentration greater than 9 ppm)

Lead

Lead has not exceeded fêderal and state lead standards since 1982. Pico Rivera recorded the maximum quarterly average lead concentration in the Basin in 1987 (0.26 $\mu g/m^3$). This concentration was 17 percent of the federal standard.

Figure 2-3 shows the maximum quarterly average lead concentration at Lynwood from 1976 through 1987. Maximum quarterly average lead concentrations at Lynwood have decreased 90 percent between 1976-78 and 1985-87 from 4.39 $\mu g/m^3$ to 0.44 $\mu g/m^3$. Atmospheric lead concentrations have decreased significantly as the lead content of gasoline has decreased.

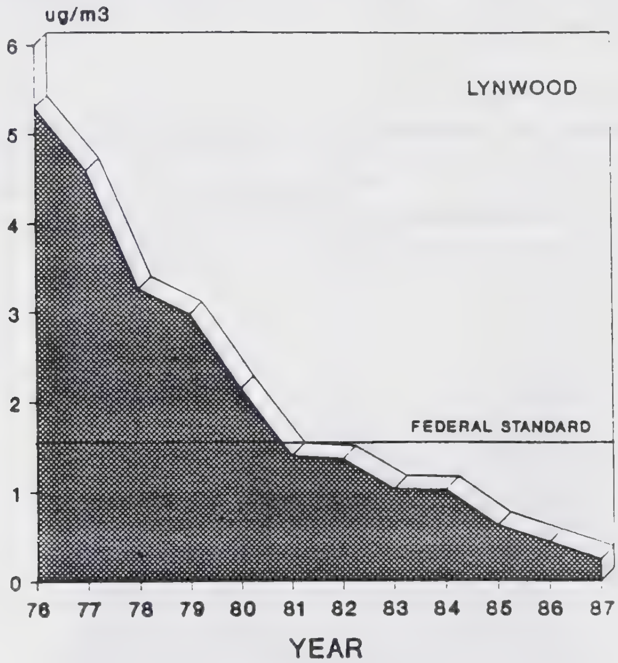


FIGURE 2-3

LEAD

Annual Maximum Quarterly Average, 1976-1987
Compared to Federal Standard
(Quarterly average concentration
greater than 1.5 $\mu g/m^3$)

Nitrogen Dioxide (NO_2)

Nitrogen dioxide exceeded the federal standard in 1987 at 2 of 20 monitoring locations, both in Los Angeles County. Pomona recorded the highest annual average (0.0547 ppm) which exceeding the federal standard by 2 percent. The other exceedance occurred at Los Angeles (0.0537 ppm).

The California state standard (1-hour average greater than 0.25 ppm) was exceeded at six locations in Los Angeles and Orange counties. Los Angeles, exceeding the standard on four days, was the only location recording more than one exceedance. This location also recorded the highest 1-hour concentration (0.42 ppm).

Figure 2-4 shows annual average nitrogen dioxide concentrations at Los Angeles between 1976 and 1987. Two 3-year averages a decade apart show that the average nitrogen dioxide concentration decreased by 16 percent. The decrease was from an average of 0.0692 ppm between 1976 and 1978 to an average of 0.0583 ppm between 1985 and 1987.

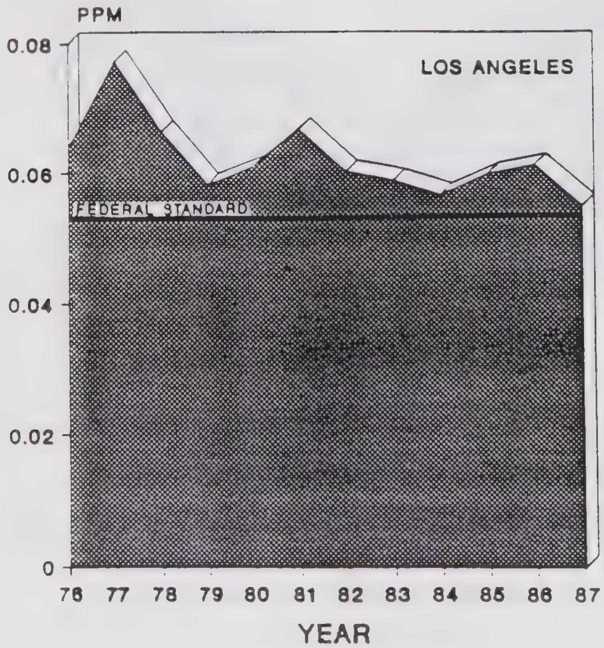


FIGURE 2-4

NITROGEN DIOXIDE

Annual Average Concentration Compared To Federal Standard, 1976-1987
(Annual arithmetic mean concentration greater than 0.053 ppm)

Ozone

Ozone was monitored at 28 locations in the Basin in 1987. Both federal and state ozone standards were exceeded at all locations . Twenty-four of the locations also exceeded the Stage I Episode level for ozone (1-hour average concentration greater than 0.20 ppm).

Figure 2-5 shows where and how often ozone exceeded the federal standard in 1987. It was exceeded least frequently in the coastal areas and most frequently in an area extending from the eastern San Fernando Valley, through the San Gabriel Valley and into the Riverside-San Bernardino area, and adjacent mountains.

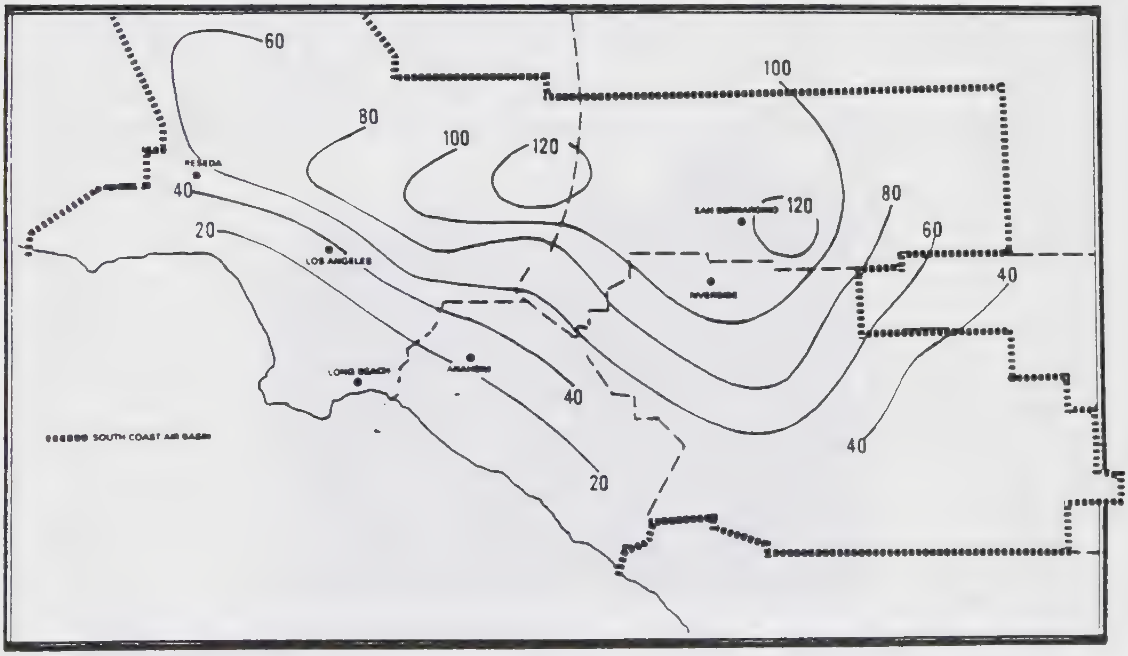


FIGURE 2-5

OZONE

Number Of Days Exceeding the Federal Standard In 1987
(1-hour average concentration greater than 0.12 ppm)

The greatest number of exceedances occurred at Glendora (135 days). Glendora also reported the greatest number of days (180) exceeding the state standard (1-hour average concentration greater than 0.10 ppm) and days (51) exceeding the Stage I Episode level.

No Stage II Episodes (1-hour average 0.35 ppm or greater) were recorded in 1987. The maximum 1-hour average of 0.33 ppm at Glendora was the lowest yet recorded. The only other year in which no Stage II Episodes occurred was 1984.

Figure 2-6 shows the percentage of days each year since 1976 the federal standard was exceeded at Azusa. The number of exceedances at Azusa decreased from an average of 140 days for 1976-1978, to an average of 118 days for 1985-1987.

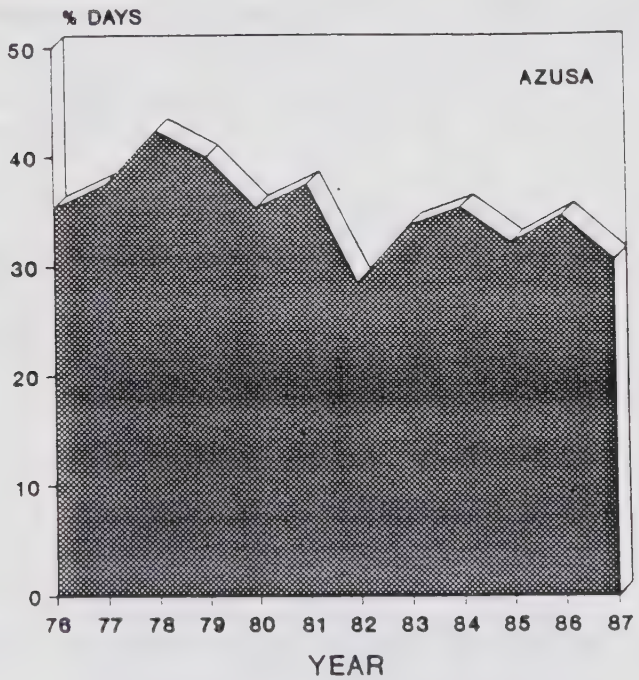


FIGURE 2-6

OZONE

Percent Days Federal Standard Exceeded, 1976-1987
(1-hour average concentration greater than 0.12 ppm)

PM10

In 1987, the Environmental Protection Agency replaced the standard for total suspended particulates (TSP) with a new PM10 standard. PM10 includes only particles 10 microns or less in diameter which are capable of penetrating the body's defense system and reaching the lungs.

PM10 exceeded the federal annual standard over a large part of the Basin. The highest annual average PM10 concentration was 80 percent above the standard. PM10 also exceeded the federal 24-hour standard (24-hour average greater than 150 $\mu g/m^3$) in a large part of the Basin. All locations recorded exceedances of the more stringent state standards (annual geometric mean PM10 greater than 30 $\mu g/m^3$, and 24-hour average PM10 greater than 50 $\mu g/m^3$).

Figure 2-7 shows the 1987 annual average PM10 concentrations in different areas of the Basin. Concentrations were highest in the inland valleys, reaching a maximum at Riverside-Rubidoux (90 $\mu g/m^3$).

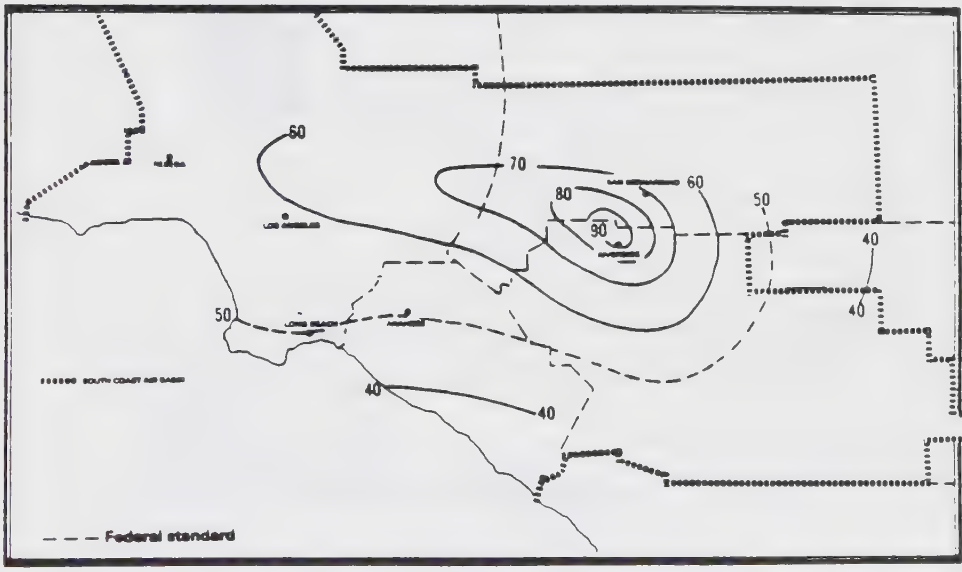


FIGURE 2-7

PM10

1987 Annual Average Concentration Compared to Federal Standard
(Annual arithmetic mean concentration greater than 50 $\mu g/m^3$)

The District began monitoring for PM10 late in 1984. The federal standard was exceeded on an average of 13 percent of days from 1985 through 1987 at Riverside-Rubidoux, the most severely affected location (Figure 2-8).

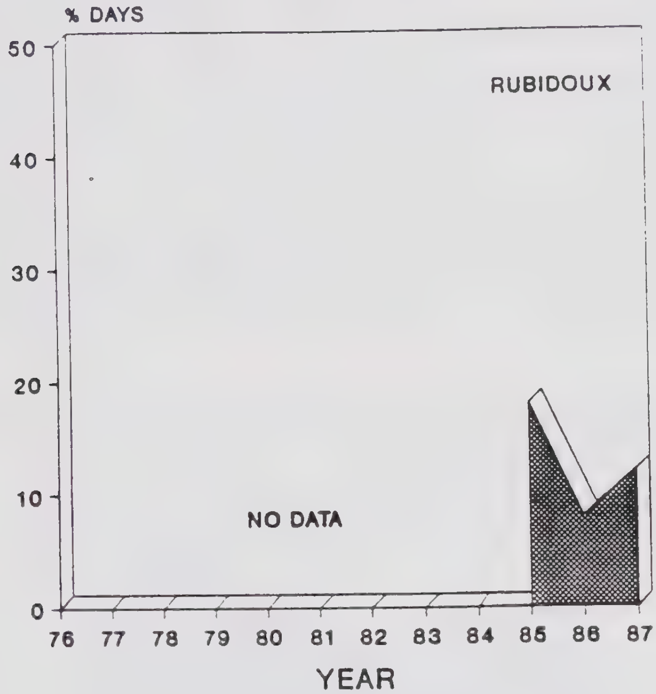


FIGURE 2-8

PM10

Percent Days Federal Standard Exceeded, 1985-1987
(24-hour average concentration greater than 150 $\mu g/m^3$)

Sulfate

There is no federal standard for sulfate. In 1987, for the first time since monitoring began in the mid-1960's, sulfate met the California state standard everywhere in the Basin. The maximum 24-hour average sulfate concentration (20.6 $\mu g/m^3$), measured at Anaheim, was 82 percent of the state standard .

Figure 2-9 shows the percentage of days each year exceeding the state sulfate standard at Los Angeles. Exceedances decreased over the period, from an average of 4.7 percent of days 1976 through 1978, to none for 1985 through 1987. (Long Beach did exceed the standard an average of 1.2 percent of days sampled between 1985 and 1987, but there are no data for the earlier period for comparison.)

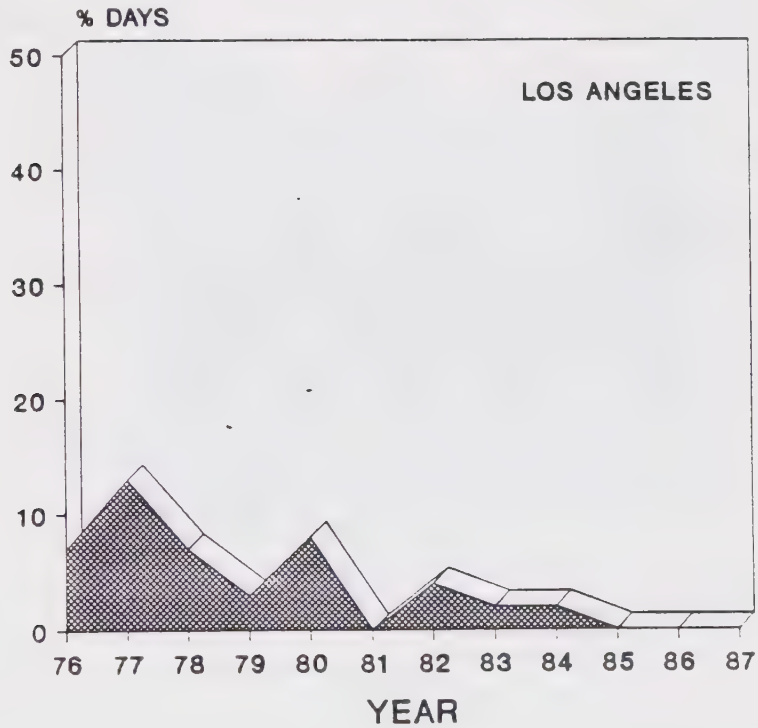


FIGURE 2-9

SULFATE

Percent of Days State Standard Exceeded, 1976-1987
(24-hour average concentration
greater than or equal to 25 $\mu g/m^3$)

Sulfur Dioxide

Sulfur dioxide concentrations did not exceed the federal or state ambient air quality standards anywhere in the Basin in 1987. Pico Rivera reported the highest 1-hour average, a maximum of 0.09 ppm.

Figure 2-10 shows the annual average sulfur dioxide concentration at Long Beach between 1976 and 1987. The concentrations have been well below the federal annual standard throughout the period.

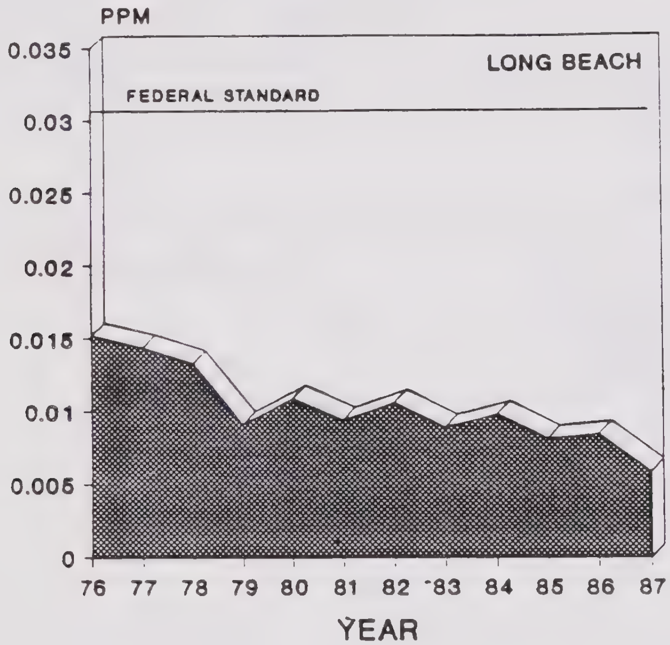


FIGURE 2-10
SULFUR DIOXIDE
Annual Average Concentration Compared To Federal Standard, 1976-1987
(Annual arithmetic mean concentration
greater than 0.03 ppm)

Visibility

There is no federal standard for visibility. At the most affected location, the California state visibility standard was not met on 242 days during 1987 .

Six locations in the Basin report visibility. Visibility reduction is greatest in the inland valley areas where particulate matter concentrations are highest. The station reporting the greatest number of days (242) exceeding the standard in 1987 was Burbank.

Figure 2-11 shows the number of days that the visibility standard was exceeded at Ontario from 1976 through 1987. The 3-year average decreased from 266 days for 1976-1978 to 241 days for 1985-1987, a 9 percent improvement.

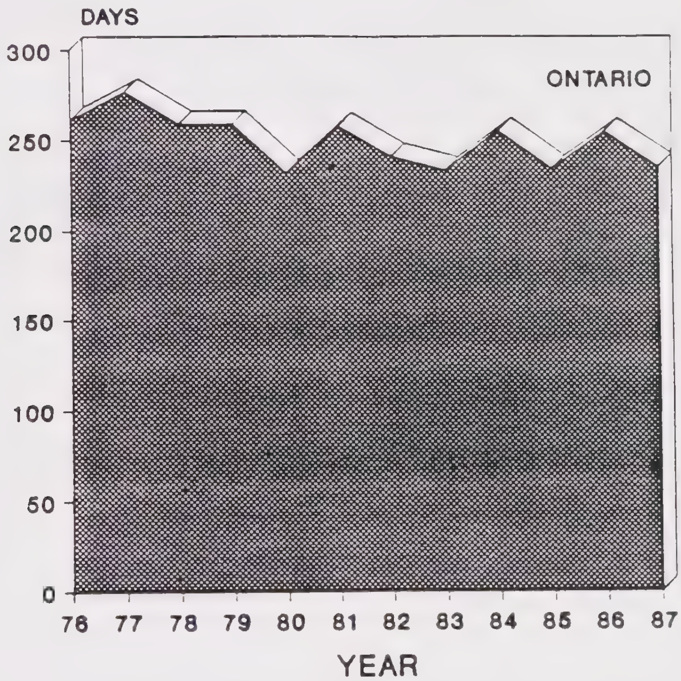


FIGURE 2-11

VISIBILITY

Number Of Days Not Meeting State Standard, 1976-1987
(Visibility less than 10 miles with
relative humidity less than 70 percent)

CHAPTER 3

CURRENT AND FUTURE EMISSIONS

Introduction
Current Emissions
Future Emissions

INTRODUCTION

The goal of the Air Quality Management Plan is the identification of programs for the South Coast Air Basin which lead to the attainment of state and federal ambient air quality standards. In order to propose effective programs, it is first necessary to identify the sources of pollution and to quantify the type and amount of emissions they contribute. This chapter summarizes emissions occurring in the Basin during the base year 1985 and predicted to occur in the years 2000 and 2010. The estimates of future emissions are those expected if no additional air quality rules and regulations were introduced after 1987. The predicted emissions for 2000 and 2010 thus provide a baseline from which the effects of proposed rule changes can be evaluated. The air quality modeling results reported in Chapter 5 use as input data the base year and future emissions.

CURRENT EMISSIONS

Appendix III-A presents emissions data for total and reactive organic gases, oxides of nitrogen and sulfur, carbon monoxide, and particulate matter. Appendix III-C shows emissions data for particulate matter with an aerodynamic diameter of less than 10 microns (PM_{10}). For detailed information on the terminology and methodology used in developing emissions inventories refer to the 1982 Revision to the AQMP and its appendices, the 1983 Emissions Inventory published in 1986, and the appendices to this document.

Emissions Inventory Development

In cooperation with the Air Resources Board and SCAG, the District develops a complete emissions inventory about once every four years. The 1983 emissions inventory is the most recent and complete inventory currently available. A 1987 emissions inventory is being developed and will be ready by 1990. In order to use more current data for this 1988 AQMP Revision, a

1985 emissions inventory was prepared utilizing recent data where possible and updating other data from 1983.

A number of studies are currently in progress to quantify emission levels of additional sources not included in the emissions inventory. A total of forty-seven source categories have been examined with an emphasis on statewide emissions of reactive organic gases and particulate matter. Based on preliminary results, eight sources including roofing asphalt, exempt stationary internal combustion engines, and wind erosion were selected for further refinement of statewide emission estimates. A summary of the results is presented in the Addendum to Appendix III-A.

Preliminary efforts have been made to establish a methodology for calculating uncertainties in emission estimates. The methodology incorporates the errors resulting from both random and systematic errors, however subjective estimates by knowledgeable analysts are required in order to constrain the confidence limits on emission values. Results from this study are summarized in the Addendum to Appendix III-A.

The estimates for emission levels from uninventoried sources and emission uncertainties have not been included in our inventory because the emission estimates are generic and only for statewide levels. They will, however be included in the emissions inventory as soon as the spatial allocation and emission levels are determined for the South Coast Air Basin.

Stationary Sources

Stationary sources can be divided into two major categories: (1) point sources which have one or more emission sources at a facility with an identified location and (2) area sources which consist of many small emission sources for which locations are not specifically identified but for which emissions over a given area may be calculated using socioeconomic data. For major point sources (i.e., those emitting more than 18 tons/year of any one of the criteria air contaminants), actual data for the year 1985 were used. Data for point sources emitting less than 18 tons/year were either taken from the 1983 emissions inventory or, where possible, from more recently acquired data. For area sources, socioeconomic data for the period 1983-1985 were used to update the 1983 emissions inventory.

Mobile Sources

On-road vehicle emissions are calculated using socioeconomic data provided by SCAG, spatial distribution data for on-road motor vehicles from Caltrans' Direct Travel Impact Model (DTIM), and emissions factors obtained from the Air Resources Board (EMFAC7D). All other mobile sources were calculated as area sources. The socioeconomic data for 1985 were interpolated from the 1984 and 2000 data provided by SCAG.

Emissions Summaries by Pollutant

Summaries of 1985 emissions data are presented in Table 3-1. Emissions of the criteria pollutants, ROG (reactive organic gases), NOx (nitrogen oxides), SOx (sulfur oxides), CO (carbon monoxide), PM (particulate matter) and PM10 (particulate matter with an aerodynamic diameter less than 10 microns), are listed by major source category. All emissions are given in tons/average annual day, obtained by dividing total emissions for the year by 365. The South Coast Air Basin is divided into a grid system composed of 5 km by 5 km grid cells defined by Universal Transverse Mercator (UTM) coordinates. Both point and area source emissions are allocated to individual grid cells within this system. In some cases, variations in temperature, hours of operation, speed of motor vehicles or other factors are important for modeling purposes. Hence, gridded emissions data used for some modeling applications may differ from the averaged data presented here.

TABLE 3-1

Summary Of Emissions
By Major Source Categories: 1985 Base Year
(tons/day)

SOURCE CATEGORY	ROG	NOx	SOx	CO	PM*	PM10*
Stationary Sources						
Fuel Combustion	17	254	18	67	11	10
Waste Burning	1	1	1	4	1	1
Solvent Use	382	-	-	-	1	1
Petroleum Process Storage & Transfer	81	10	27	3	4	3
Industrial Processes	24	9	8	6	17	12
Miscellaneous Processes	85	11	2	110	1,514	652
Total Stationary Sources	590	285	56	190	1,548	679
Mobile Sources						
On-Road Vehicles	578	620	35	4,752	84	50
Other Mobile	78	135	30	488	13	12
Total Mobile Sources	656	755	65	5,240	97	62
Total	1,246	1,040	121	5,430	1,645	741

*PM and PM10 emissions from paved road dust are listed under stationary sources.

Emissions Summaries by Category

The relative contributions by stationary and mobile sources to emissions of air pollutants in the Basin are shown in Figures 3-1 and 3-2. Stationary and mobile sources are each subdivided into two major categories. Mobile sources consist of on-road (e.g., light duty passenger) and other mobile sources (e.g., trains and ships). Stationary sources are grouped into a residential/commercial/services category (e.g., architectural coatings, dry cleaners, and consumer products), and an industrial/manufacturing category (e.g., chemical manufacturing, petroleum production, and electric utilities).

Stationary sources contribute large amounts of ROG (590 tons/day), NOx (285 tons/day), and SOx (56 tons/day) emissions. The residential /commercial/services and industrial/manufacturing categories contribute approximately the same amount of ROG and NOx emissions, whereas industrial/manufacturing sources produce the most significant amount of stationary SOx emissions.

Mobile sources are responsible for most emissions of CO (96%) and NOx (72%) and for a significant amount of ROG (52%) and SOx (54%). It appears that stationary sources account for nearly all emissions (94%) of PM. However, this is misleading because paved road dust is included in the emissions total for stationary sources. Thus, in 1985 mobile sources were either directly or indirectly responsible for the largest share of emissions of all criteria air pollutants.

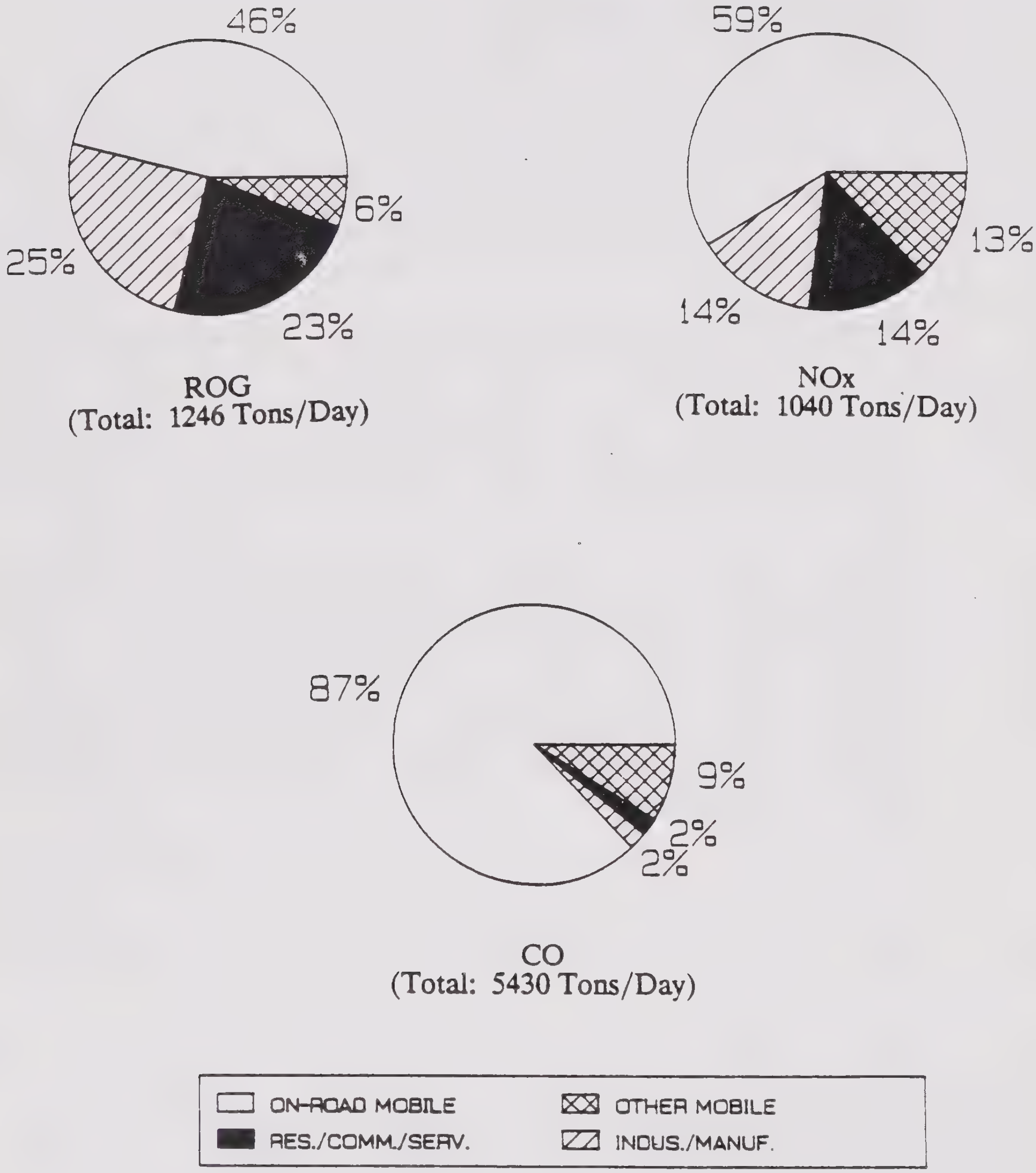
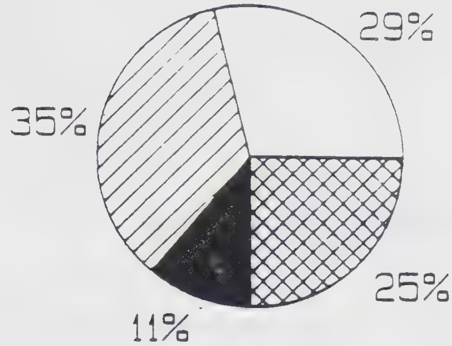


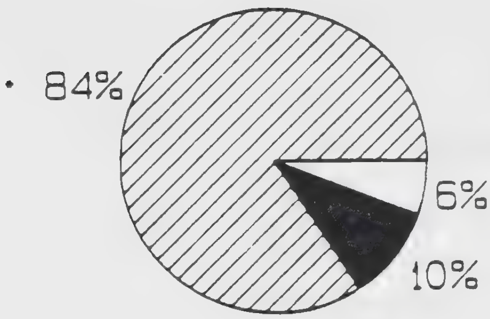
FIGURE 3-1

Relative Contribution By Stationary
And Mobile Sources to 1985 Emissions



SOx
(Total: 121 Tons/Day)

ON-ROAD MOBILE
OTHER MOBILE
RES./COMM./SERV.
INDUS./MANUF.



PM
(Total: 1645 Tons/Day)

* Includes Paved Road Dust

TOTAL MOBILE
RES./ COMM./SERV.
INDUS./MANUF.

FIGURE 3-2

Relative Contribution By Stationary, On-Road Mobile and Other Mobile Sources to 1985 Emissions

FUTURE EMISSIONS

Summary of Baseline Emissions

The years 2000 and 2010 were chosen for baseline emissions forecasts which indicate future emissions if no additional regulations were adopted after January 1, 1988. These forecasts were derived using emissions from the base year 1985, remaining emissions after implementation of District and ARB rules adopted prior to December 31, 1987, and the growth of different sources of emissions between the base and future years. In Table 3-2, the emissions contributed by stationary, on-road mobile, and other mobile sources are summarized for the years 1985, 2000, and 2010. The data for major source categories are presented in Tables 3-3 and 3-4. Future baseline emissions summaries along with the methodology used to develop the emissions forecast are presented in Appendices III-B and III-C.

Growth Forecast

In Appendix III-D, SCAG's baseline growth forecast for population and employment is presented. Projected growth for various socioeconomic categories (e.g., population, housing, and motor vehicles) was used to calculate future emissions. It should be noted that SCAG's usage of the term baseline refers only to a specific set of socioeconomic data for the years 2000 and 2010 and should not be confused with baseline emissions which are the emissions expected should no further regulations be adopted. Table 3-5 summarizes growth in certain categories for the years 1985, 2000, and 2010.

Impact of Growth

Despite the stringent air quality regulations now in effect, baseline emissions of criteria air pollutants do not decrease appreciably between the years 1985 and 2010. This is a consequence of regional growth in population, housing and motor vehicle usage. Figures 3-3 through 3-7 show the effect of growth on future emissions. If the effects of growth were removed, emissions of

criteria air contaminants would, with the exception of PM, be expected to decrease substantially between 1985 and 2010, as shown below:

POLLUTANTS	WITHOUT GROWTH	WITH GROWTH
ROG	*-40%*	*- 9%*
NOx	*-43%*	*- 2%*
CO	*-61%*	*- 17%*
SOx	*-12%*	*+16%*
PM	+ 0%	+47%

The spatial distributions of net changes in emissions of ROG, NOx, and CO between the years 1985 and 2010 are shown in Figures 3-8 through 3-10. Increases in emissions are indicated by progressively darker shades of red and decreases by shades of blue. Emissions of ROG, NOx, and CO are all expected to decrease significantly in the western part of the Basin, but are predicted to increase to the east.

TABLE 3-2

Summary Of Baseline Emissions
For The South Coast Air Basin
(tons/day)

SOURCE CATEGORY	ROG	NOx	SOx	CO	PM*
			YEAR 1985		
Residential/Commercial/Services	280	142	13	82	210
Industrial/Manufacturing	310	144	43	108	1,338
On-Road Mobile Sources	578	619	35	4,751	84
Other Mobile Sources	78	135	30	489	13
Total	1,246	1,040	121	5,430	1,645
			YEAR 2000		
Residential/Commercial/Services	294	164	16	74	261
Industrial/Manufacturing	356	90	53	123	1,855
On-Road Mobile Sources	257	477	28	3,006	96
Other Mobile Sources	112	173	36	682	15
Total	1,019	904	133	3,885	2,227
Change from 1985 Emissions	-227	-136	+*12*	-1,545	+582
			YEAR 2010		
Residential/Commercial/Services	322	184	19	65	287
Industrial/Manufacturing	377	87	52	140	2,011
On-Road Mobile Sources	*302*	*554*	*31*	*3,481*	111
Other Mobile Sources	129	192	38	781	16
Total	*1,130*	*1,017*	*140*	*4,467*	2,425
Change from 1985 Emissions	*-116*	*-23*	+*19*	*-963*	+780

*PM emissions from paved road dust are listed under stationary sources.

TABLE 3-3

Summary Of Emissions
By Major Source Categories: 2000 Baseline
(tons/day)

SOURCE CATEGORY	ROG	NOx	SOx	CO	PM*	PM10*
Stationary Sources						
Fuel Combustion	23	226	30	108	17	15
Waste Burning	1	1	1	4	1	1
Solvent Use	431	0	0	0	1	1
Petroleum Process Storage & Transfer	77	7	27	4	4	3
Industrial Processes	27	6	8	3	18	12
Miscellaneous Processes	92	14	3	78	2,075	894
Total Stationary Sources	651	254	69	197	2,116	926
Mobile Sources						
On-Road Vehicles	257	477	28	3,006	96	49
Other Mobile	111	173	36	682	15	14
Total Mobile Sources	368	650	64	3,688	111	63
Total	1,019	904	133	3,885	2,227	989

*PM and PM10 emissions from paved road dust are listed under stationary sources.

TABLE 3-4

Summary Of Emissions
By Major Source Categories: 2010 Baseline
(tons/day)

SOURCE CATEGORY	ROG	NOx	SOx	CO	PM*	PM10*
Stationary Sources						
Fuel Combustion	24	241	31	114	18	15
Waste Burning	1	1	1	5	1	1
Solvent Use	469	-	-	-	1	1
Petroleum Process Storage & Transfer	79	7	27	4	5	3
Industrial Processes	29	7	9	3	19	13
Miscellaneous Processes	97	15	3	79	2,254	973
Total Stationary Sources	699	271	71	205	2,298	1,006
Mobile Sources						
On-Road Vehicles	*302*	*554*	*31*	*3,481*	111	56
Other Mobile	129	192	38	781	17	15
Total Mobile Sources	*431*	*746*	*69*	*4,262*	128	71
Total	*1,130*	*1,017*	*140*	*4,467*	2,426	1,077

*PM and PM10 emissions from paved road dust are listed under stationary sources.

TABLE 3-5

Socioeconomic Forecasts
For The South Coast Air Basin

SOCIOECONOMIC CATEGORY	YEAR		
	1985[a]	2000 (%Growth)[b]	2010 (%Growth)[b]
Population (Thousands)	11,294	14,053 (+24%)	15,449 (+37%)
Housing Units (Thousands)	4,234	5,471 (+29%)	6,181 (+46%)
Total Employment (Thousands)	5,493	7,294 (+33%)	8,087 (+47%)
Retail Employment (Thousands)	877	1,174 (+34%)	1,291 (+47%)
VMT (Thousand Miles)	234,407	330,899 (+41%)	393,116 (+68%)
In Use Vehicles (Thousands)	7,688	9,237 (+20%)	10,394 (+35%)
Vehicle Trips (Thousands)	28,465	36,013 (+26%)	*39,893 (+40%)*

*1985 Socioeconomic data were calculated by interpolating between 1984 and 2000.

[b]Percentage growth is relative to the base year 1985.

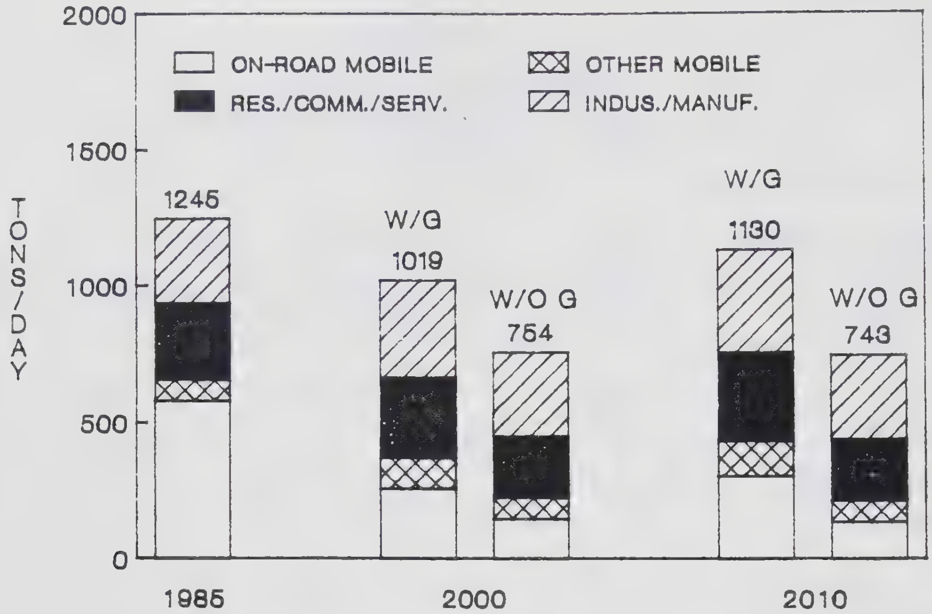


FIGURE 3-3

ROG Emissions With And Without Growth

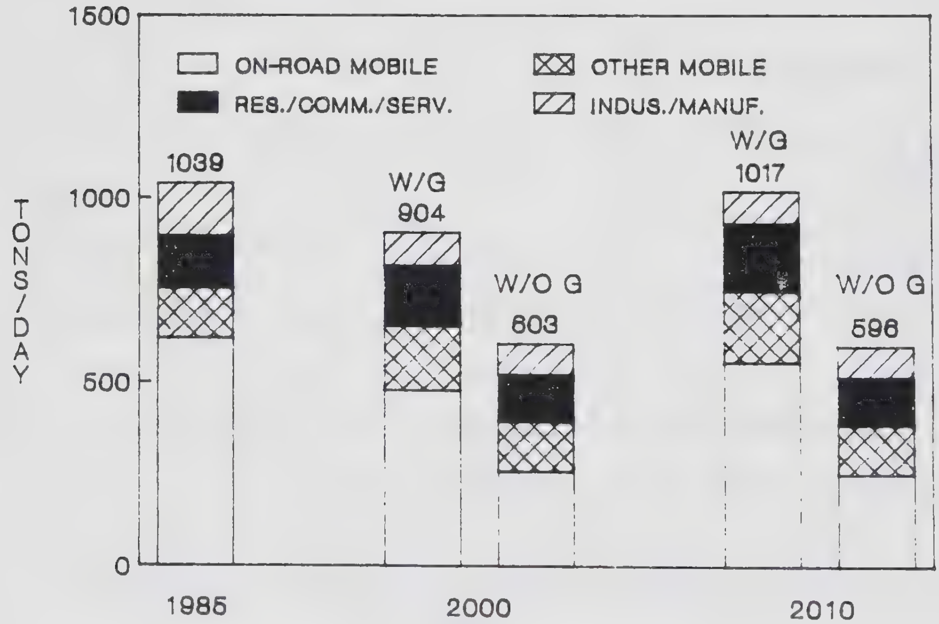


FIGURE 3-4

NOx Emissions With And Without Growth

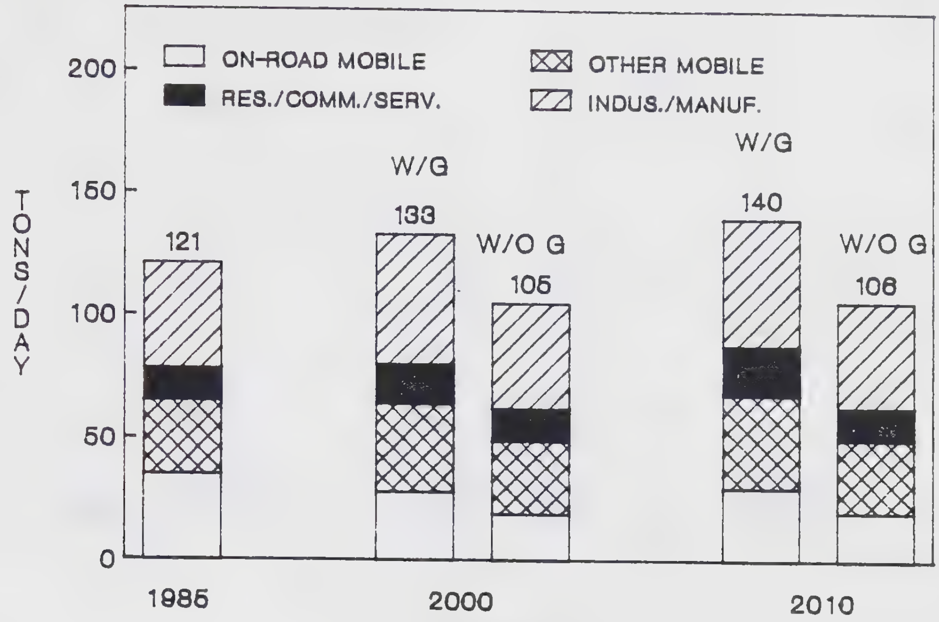


FIGURE 3-5

SOx Emissions With And Without Growth

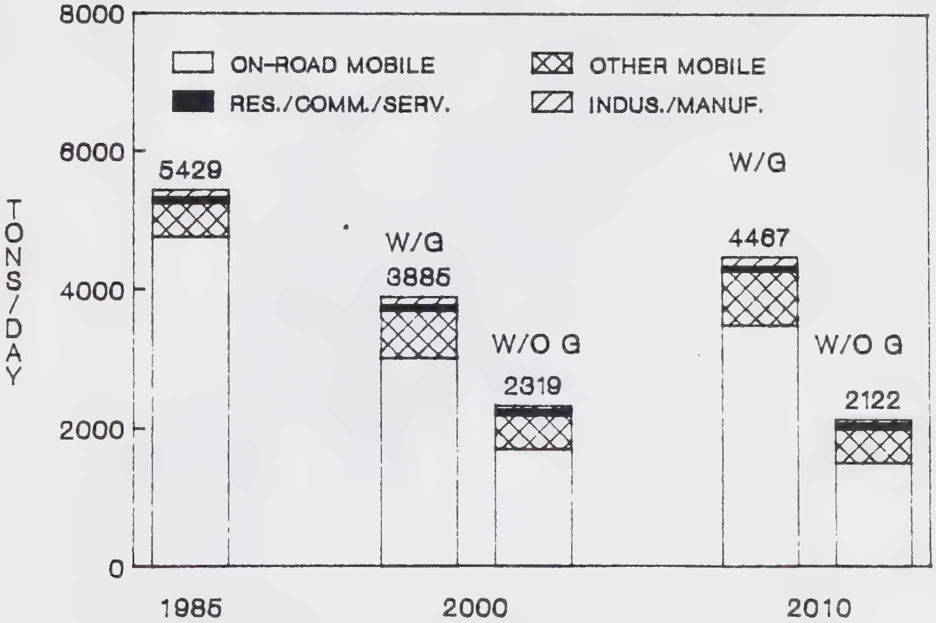
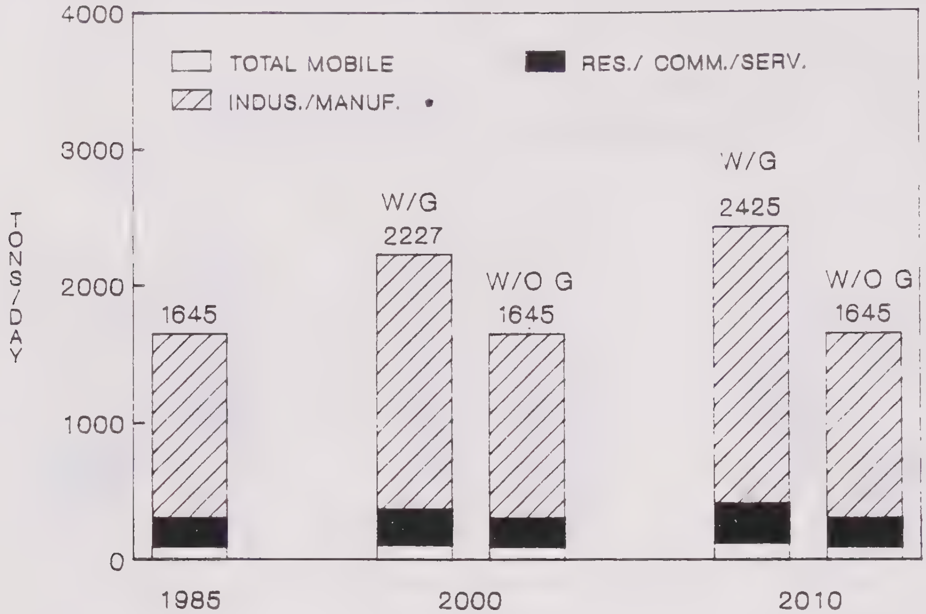


FIGURE 3-6

CO Emissions With And Without Growth



*Includes Paved Road Dust

FIGURE 3-7

PM Emissions With And Without Growth

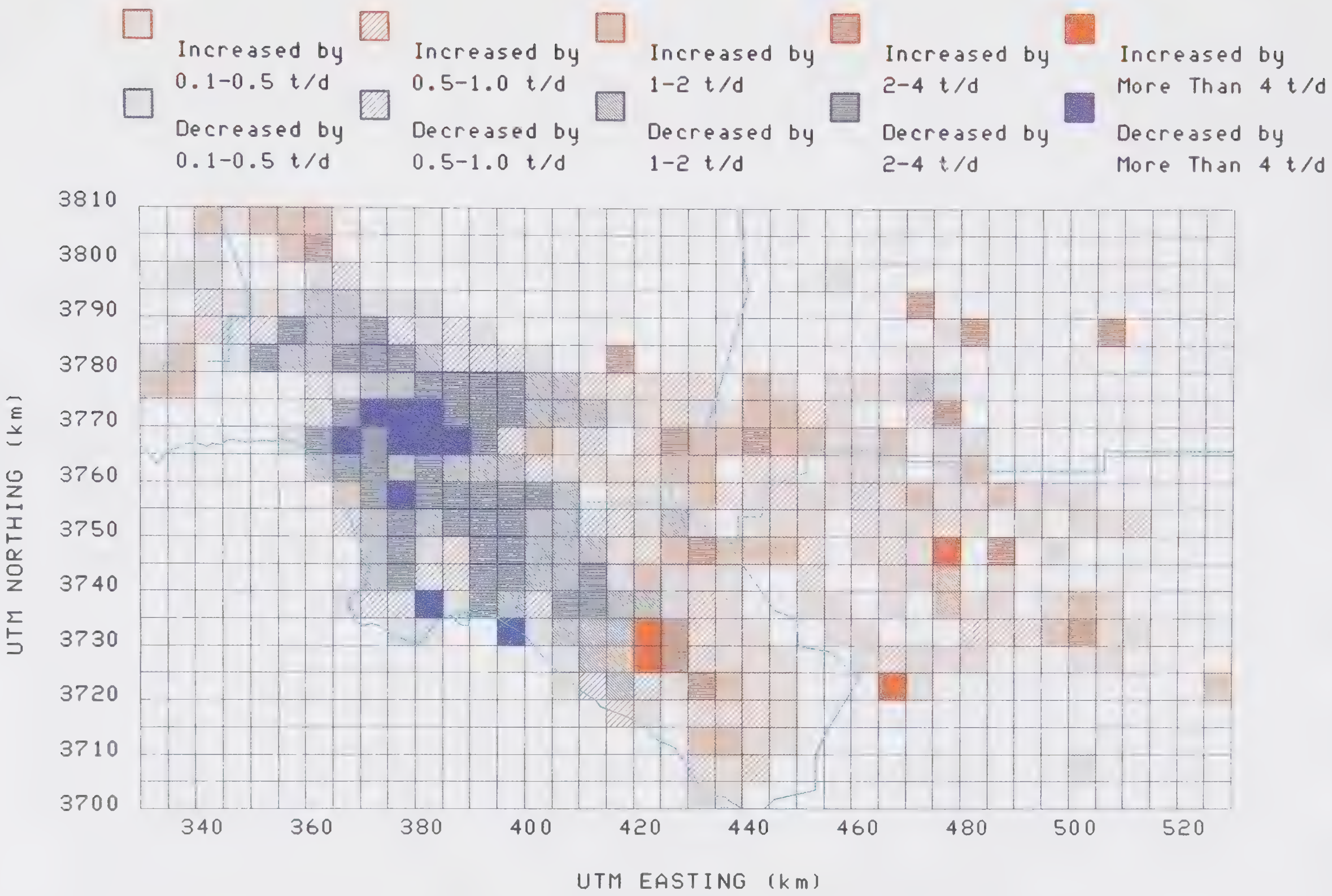


FIGURE 3-8
Changes In Daily ROG Emissions From 1985 To 2010

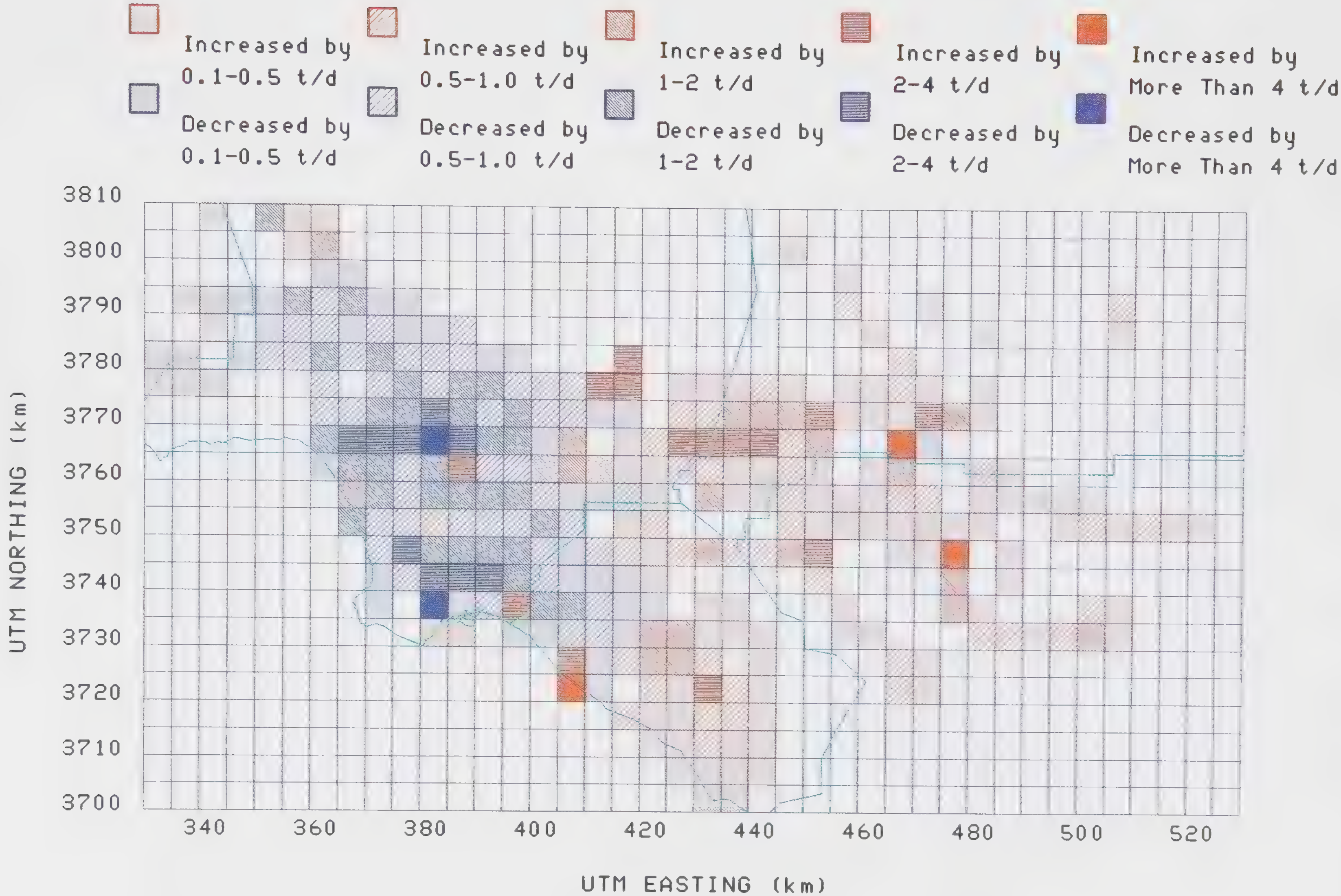


FIGURE 3-9
Changes In Daily NOx Emissions From 1985 To 2010

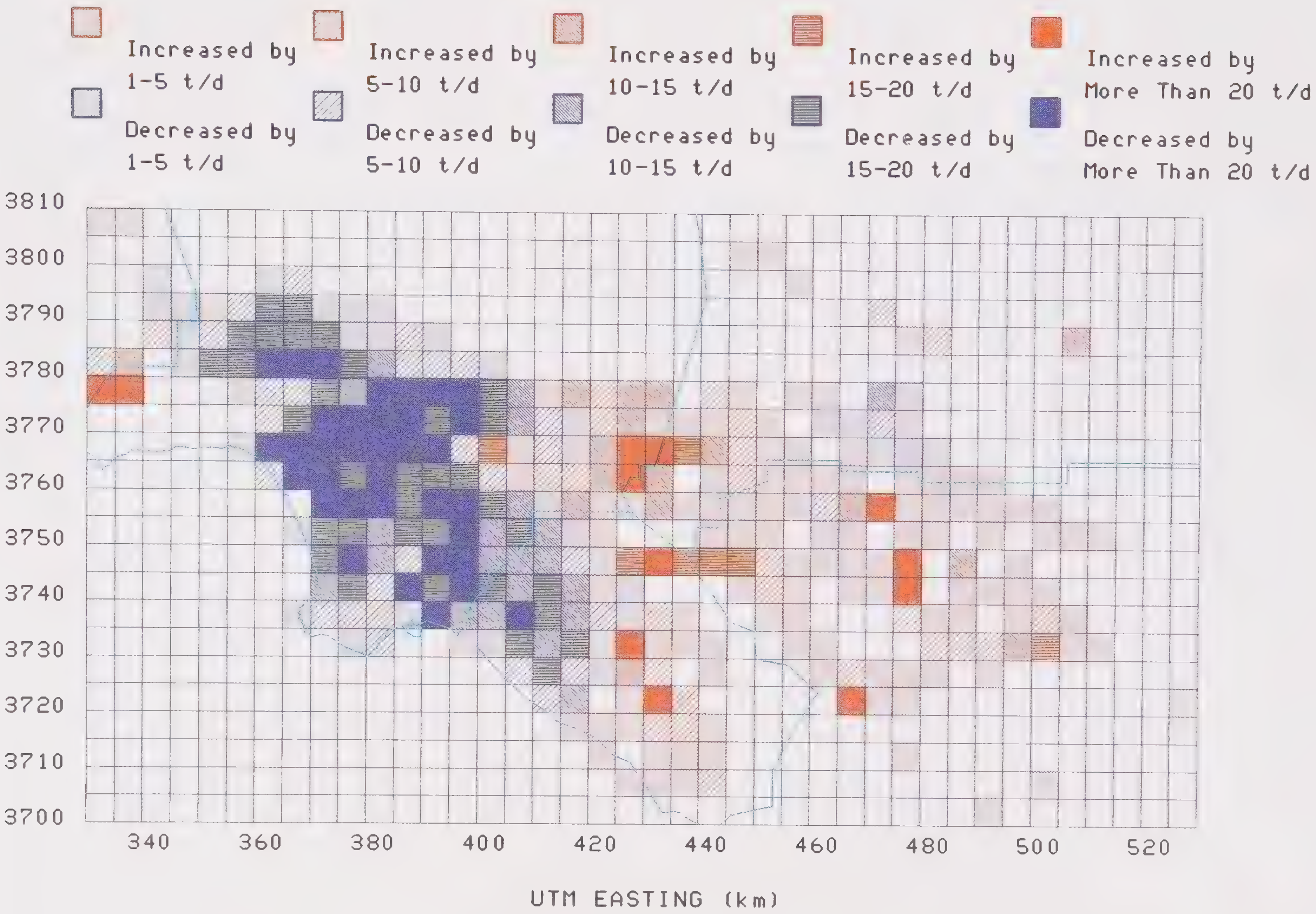


FIGURE 3-10
Changes In Daily CO Emissions From 1985 To 2010

CHAPTER 4

AQMP CONTROL STRATEGY

Introduction

Tier I Control Measures

Tier II Control Targets

Tier III Technological Breakthroughs

Energy Future

Contingency Measures

INTRODUCTION

This chapter describes an attainment strategy for the draft 1988 AQMP. All control methods potentially available for implementation by 2007 were identified and, to the extent possible, quantified. The quantified measures were modeled to determine their effectiveness in meeting the attainment goals. Control methods are categorized into three tiers, depending upon their readiness for implementation. The three tiers are:

Tier I- Full implementation of known technological applications and effective management practices.

Tier II- Significant advancement of today's technological applications and vigorous regulatory intervention.

Tier III- Development of new technology.

The effectiveness of each tier in improving air quality and the methods used to determine that effectiveness are described in Chapter 5. As a result of this analysis, all measures included in this chapter are needed to meet the attainment goals. A set of contingency measures is also included in this chapter. They will be considered, should this three-tiered control strategy fail to provide the expected emission reductions. Chapter 6 discusses the implementation activities for this draft plan.

TIER I CONTROL MEASURES

Introduction

Tier I control measures are defined as those that can be adopted in the next five years with currently available technological applications and management practices. Implementation (and construction) of these measures will occur over the next twenty years. Many of the measures were included in the 1979 and 1982 AQMPs, or were discussed in District Working Paper No. 4: Short-Range Control Measures, and the Path to Clean Air:

Attainment Strategies. Implementation of Tier I transportation facility measures are limited by available funding.

Tier I control measures reduce emissions by:

> **Maximizing reduction in the use of pollutant-emitting materials;**
>
> **Maximizing the substitution of non-polluting or less-polluting materials;**
>
> **Maximizing the use of the most efficient pollution control devices;**
>
> **Maximizing compliance and maintenance programs for fugitive emissions;**
>
> **Maximizing the efficiency of the transportation infrastructure to provide less polluting forms of transportation;**
>
> **Maximizing the effectiveness of existing measures through improved administrative practices;**
>
> **Maximizing strong public and private commitments for the required implementation actions.**

Emission reductions expected to result from implementation of all Tier I control measures are summarized in Table 4-1. The total estimated control cost for Tier I measures with cost data is about $*7.2* million per day (1987 dollars). This represents an average cost of about $*.60* per day to the Basin residents once all controls are in place. Improved technology may be able to reduce these costs. On the other hand, the Basin's air pollution damage costs to health, materials, agriculture, and *visibility* amounted to about $*10 to 20* million daily or $*0.8 to 1.6* daily per capita in 1987. These costs reflected the damage as a result of nonattainment of ozone and particulate standards. Therefore, the air quality benefits would significantly outweigh the estimated pollution control cost of implementing these control measures. As presented in Chapter 5, Tier I control measures would result in meeting the federal NO_2 and CO standards. The ozone and PM_{10} standards would still be greatly exceeded, requiring implementations of control measures beyond those available with known technology and improved management practices.

The following sections summarize the proposed control measures by source category, potential emission reductions, and estimated cost. Emission

reductions for each source category are the maximum that can be achieved after implementation ignoring the effect of competing control measures in other source categories. Estimated costs are independent of other control measures and are presented in 1987 dollars. Appendix IV-D, prepared by the District, describes the method used in estimating costs. Appendix IV-A presents more detailed documentation of measures for stationary sources. Measures to control transportation sources are documented in Appendices IV-A, IV-F, and IV-G. Appendix IV-A is prepared by the District; Appendix IV-F by the Air Resources Board (ARB); and Appendix IV-G by the Southern California Association of Governments (SCAG).

TABLE 4-1

Summary of Tier I Emission Reductions

Sources	Pollutant (Tons/Day)				
	ROG	NOx	CO	SOx	PM
Year 2010 Baseline	*1130*	*1017*	*4467*	*140*	2426
Tier I Emission Reductions					
Stationary	*381*	*188*	*92*	*43*	*1063*
Transportation+	*236*	*397*	*2775*	*34*	*49*
Total	*617*	*585*	*2867*	77	*1112*
Year 2010 Remaining Emissions After Tier I	*513*	*432*	*1600*	*63*	*1314*

+ Emission reductions do not reflect recent changes in on-road mobile sources emission inventory. However, the impact of such changes on emission reductions in mobile source category would be minor and would not change the overall AQMP results.

Stationary Sources

Surface Coating and Solvent Use

The 22 control measures in this section focus on controlling ROG emissions resulting from direct solvent use, consumer product use, and coating applications. Table 4-2 provides a list of control measures in this category, of which four measures have already been adopted by the District during the draft AQMP planning process. Appendix IV-A discusses these measures in detail. Control methods include: application of low-solvent coatings in surface coating operations (e.g., in architectural coatings and automobile assembly coating); use of higher transfer efficiency techniques to apply coating solvents (e.g., in aerospace assembly and component coating); and, to a certain extent, use of add-on control devices (e.g., for wood flatstock coating).

The total ROG emission reductions for the group are *219* tons/day.

For those control measures with cost data, the total cost is $*380,000*/day. The emission reduction associated with measures with cost data is *196* tons/day of ROG.

Petroleum and Gas Production and Distribution

The 15 control measures in this category are aimed at reducing emissions from oil and gas production-related operations, petroleum refining processes, and product distribution. Table 4-3 shows control measures in this category. The control measure for refinery boilers and heaters has been adopted by the District during the draft AQMP planning process. Appendix IV-A discusses these measures in detail. For combustion-associated processes, the most stringent add-on control devices are for achieving further emission reductions (e.g., for oil field steam generators). Emissions from product distribution

TABLE 4-2

Tier I Control Measures-

Surface Coating and Solvent Use

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum, No. Page No.
A-1	Further Emission Reductions from Wood Flatstock Coating [ROG]	IV-A, pp. A4-A5	--------
A-2[1]	Further Emission Reductions from Manufactured Wood Furniture and Miscellaneous Wood Products Coating [ROG]	IV-A, pp. A6-A9	IV-A, p. 4
A-3	Further Emission Reductions from Can and Coil Coating [ROG]	IV-A, pp. A10-A12	--------
A-4	Further Emission Reductions from Aerospace Assembly and Component Coating [ROG]	IV-A, pp. A13-A15	IV-A, p. 4
A-5	Further Emission Reductions from Automobile Assembly Coating [ROG]	IV-A, pp. A16-A18	------
A-6[2]	Substitute Coatings/Solvents Used in Automobile Refinishing [ROG]	IV-A, pp. A19-A23	IV-A, p. 5
A-7[3]	Substitute Solvents Used for Marine Vessels Coatings [ROG]	IV-A, pp. A24-A26	IV-A, p. 5
A-8a	Further Control of Emissions from Architectural Coatings [ROG]	--------	IV-A, pp. 6-7
A-8b	Emission Charges on Architectural Coatings [ROG]	IV-A, pp. A27-A30	IV-A, p. 6
A-9	Further Emission Reductions from Paper, Fabric and Film Coating [ROG]	IV-A, pp. A31-A33	--------
A-10	Further Emission Reductions from Graphic Art Operation [ROG]	IV-A, pp. A34-A36	--------
A-11	Substitute Solvents Used for Clean-up of Surface Coating [ROG]	IV-A, pp. A37-A39	--------
A-12	Further Emission Reductions from Metal Cleaning and Degreasing [ROG]	IV-A, pp. A40-A45	--------
A-13	Control of Emissions from Rigid and Flexible Disc Manufacturing Operation [ROG]	IV-A, pp. A46-A47	--------

TABLE 4-2
Tier I Control Measures-
Surface Coating and Solvent Use
(Continued)

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum,No. Page No.
A-14	Control of Emissions from Expanding Plastics and Blowing Foam Manufacturing Operation [ROG]	IV-A, PP. A48-A50	IV-A, p. 8
A-15(2)	Control of Emissions from Semiconductor Manufacturing Operation [ROG]	IV-A, pp. A51-A53	IV-A, p. 8
A-16	Further Emission Reductions from Perchloroethylene Dry Cleaning Operation [ROG]	IV-A, pp. A54-A57	IV-A Modification, p. M3
A-17	Further Emission Reductions from Petroleum Dry Cleaning Operation [ROG]	IV-A, pp. A58-A60	IV-A, pp. 8-9
A-18	Control of Emissions from Underarm Products [ROG]	IV-A, pp. A61-A63	IV-A, p. 9
A-19	Control of Emissions from Domestic Products [ROG]	IV-A, pp. A64-A66	IV-A, p. 9
A-20	Control of Emissions from Solvent Waste [ROG]	IV-A, pp. A67-A70	--------
A-21	Further Control of Emissions from Adhesives [ROG]	IV-A, pp. A71-A73	IV-A, p. 10

(1) Adopted on August 5, 1988 by the District. The measure is listed to account for emission reductions not included in emission forecasts.

(2) Adopted on July 8, 1988 by the District. The measure is listed to account for emission reductions not included in emission forecasts.

(3) Adopted on November 3, 1988 by the District. The measure is listed to account for emission reductions not included in emission forecasts.

TABLE 4-3

Tier I Control Measures-

Petroleum and Gas Production

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum,No. Page No.
B-1	Control of Emissions from Gasoline Transfer: Fail-Safe Phase-I Vapor Recovery Systems [ROG]	IV-A, pp. B4-B7	--------
B-2	Control of Emissions from Gasoline Transfer: Improved Installation and Repair of Phase-II Vapor Recovery Systems [ROG]	IV-A, pp. B8-B10	IV-A, p. 10
B-3	Control of Emissions from Open Sumps, Pits, and Wastewater Separators [ROG]	IV-A, pp. B11-B13	IV-A, pp. 10-11
B-4	Control of Emissions from Pleasure Boat Fueling Operations [ROG]	IV-A, pp. B14-B16	--------
B-5	Control of Emissions from Cyclic Steam Production Wells [ROG]	IV-A, pp. B17-B20	--------
B-6	Control of Emissions from Crude Oil Pipeline Heaters [NOx]	IV-A, pp. B21-B23	--------
B-7	Control of Emissions from Petroleum Refinery Fluid Catalytic Cracking (FCC) Units [SOx]	IV-A, pp. B24-B26	--------
B-8	Control of Emissions from Petroleum Coke Calcining Operations [SOx]	IV-A, pp. B27-B28	--------
B-9	Control of Emissions from Gas Fired Petroleum Refinery Process Heaters [PM]	IV-A, pp. B29-B31	--------
B-10	Improved Control of Emissions from Petroleum Refinery Fluid Catalytic Cracking (FCC) Units [PM]	IV-A, pp. B32-B34	--------

TABLE 4-3
Tier I Control Measures-
Petroleum and Gas Production
(Continued)

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum, No. Page No.
B-11	Control of Emissions from OCS Exploration, Development, and Production [All Pollutants]	IV-A, pp. B35-B38	IV-A, p. 11
B-12	Control of Emissions from Petroleum Refinery Flares [All Pollutants]	IV-A, pp. B39-B42	IV-A, p. 11
B-13	Further Emission Reductions from Valves, Pumps, Compressors Used in Oil and Gas Production Fields, Gas Processing Plants, Refineries and Chemical Plants [ROG]	IV-A, pp. B43-B48	IV-A, pp. 11-12; IV-A Modification, p. M3
B-14	Control of Emissions from Oil Field Steam Generators [NOx]	IV-A, pp. B49-B51	--------
B-15 (1)	Control of Emissions from Refinery Heaters and Boilers [NOx]	IV-A, pp. B52-B54	IV-A, p. 12

(1) Adopted on August 5, 1988 by the District. Measure listed to account for emission reductions not included in emission forecast.

(e.g., in gasoline transfer) will be controlled by vapor recovery systems. Effective inspection and maintenance programs and stricter emission limits are employed to control fugitive emissions (e.g., in valves, pumps and compressors).

The total emission reductions are summarized below:

	ROG	NOx	SOx	PM
Emission Reduction (Tons/Day)	15	26	16	2

The total control cost associated with these reductions is about *$1 million/day*.

Industrial and Commercial Processes

The 10 control measures for this category reduce ROG, NOx, and PM emissions from small sources which are exempt from existing District rules or from processes which are not now regulated by the District. Table 4-4 summarizes these control measures. Detailed descriptions of the control measures are contained in Appendix IV-A. Control methods in this category are heavily dependent on the most efficient add-on control devices. *Control* of non-utility internal combustion engines *with low emitting technologies* is proposed in this category. Many of the control measures limiting emissions from fuel burning may use clean fuels such as methanol to achieve the limits. Methanol use in stationary sources is discussed in Appendix IV-E, prepared by the District.

The emission reductions for this group are provided below:

	ROG	NOx	SOx	PM	CO
Emission Reduction (Tons/Day)	25	*112*	1	47	43

The total control cost for these reductions is $2.*2* million/day.

TABLE 4-4

Tier I Control Measures-

Commercial and Industrial Processes

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum, No. Page No.
C-1	Control of Emissions from Large Commercial Bakeries [ROG]	IV-A, pp. C3-C6	--------
C-2	Control of Emissions from Non-Utility Internal Combustion Engines [All Pollutants]	IV-A, pp. C41-C43	IV-A, pp. 15-16; IV-A Modification, p. M3
C-3	Control of Emissions From Commercial Charbroiling [ROG, PM]	IV-A, pp. C11-C14	--------
C-4	Further Emission Reductions from Rubber Products Manufacturing [ROG, PM]	IV-A, pp. C15-C17	--------
C-5	Control of Emissions from Afterburners [NOx]	IV-A, pp. C38-C40	IV-A, p. 15
C-6	Control of Emissions from Woodworking Operations [PM]	IV-A, pp. C21-C25	--------
C-7	Control of Emissions from Small Boilers and Process Heaters [NOx]	IV-A, pp. C26-C28	--------
C-8 (1)	Control of Emissions from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters [NOx]	IV-A, pp. C29-C31	IV-A, p. 13
C-9	Control of Emissions from Stationary Gas Turbines [NOx]	IV-A, pp. C32-C34	IV-A, p. 14; IV-A Modification, p. M4
C-10	Control of Emissions from Electric Power Generating Boilers [NOx]	IV-A, pp. C35-C37	IV-A, p. 15

(1) Adopted on September 9, 1988 by the District. Measure listed to account for emission reductions not included in emission forecast.

Residential and Public Sectors

Ten control measures are included in this category. In the residential sector, energy conservation measures are proposed in order to reduce emissions of all pollutants. In the public sector, the measures will control emissions through improved waste recycling, *energy conservation*, and administrative procedures. Table 4-5 summarizes these measures. Appendices IV-A and IV-G provide detailed descriptions of these measures.

The potential emission reductions and costs for the public sector are unknown. Total emission reductions for the residential sector are shown below:

	ROG	NOx	SOx	PM	CO
Emission Reduction (Tons/Day)	7	27	6	*498*	*23*

The cost associated with these emission reductions is currently unknown.

TABLE 4-5

Tier I Control Measures-

Residential and Public Sectors

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum,No. Page No.
D-1	Control of Emissions from Starter Fluid [ROG]	IV-A, pp. D3-D5	IV-A, p. 16
D-2	Out-of-Basin Transportation of Biodegradable Solid Waste [All Pollutants]	IV-A, pp. D14-D17	IV-A, pp. 17-20; IV-A Modification, p. M5
D-3	Control of Fugitive Emissions From Publicly Owned Treatment Works [ROG]	IV-A, pp. D18-D20	IV-A, p. 21; IV-A Modification, p. M5
D-4	Control of Emissions from Swimming Pool Water Heating [NOx]	--------	IV-A Modification, pp. M5a-M6
D-5	Control of Emissions from Residential & Commercial Water Heating [NOx]	--------	IV-A Modification, pp. M7-M10
12.a	Paved Roads	IV-G, pp. 186-190	IV-G Modification, p. M23
12.b	Unpaved Roads and Parking Lots [PM]	IV-G, pp. 191-196	IV-G Modification, p. M23
18.a	Local Government Energy Conservation Program [All Pollutants]	IV-G pp. 232-238	IV-G Modification, p. M25
18.b	Waste Recycling [All Pollutants]	IV-G, pp. 239-246	IV-G Modification, p. M25-M26
18.c	Energy Pricing, Tax,and Subsidy Incentives [All Pollutants]	IV-G, pp. 247-254	IV-G Modification, p. M26

Agricultural Processes

The 3 control measures developed for this category are aimed at controlling ROG and PM emissions, and are summarized in Table 4-6. Appendix IV-A discusses measures in this category in detail. Reformulation and alternative application techniques are recommended for controlling ROG emissions from pesticide applications. Better housekeeping procedures and alternative disposal methods (e.g., waste recycling) can reduce ROG and PM emissions from farming operations and livestock waste disposal.

Total emission reductions for this group are estimated below:

	ROG	PM	NH_3
Emission Reduction (Tons/Day)	13	0.4	24

The cost associated with these emission reductions is $22,000/day.

TABLE 4-6
Tier I Control Measures-
Agricultural Processes

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum, No. Page No.
E-1	Control of Emissions from Pesticide Application [ROG]	IV-A, pp. E3-E6	
E-2	Control of Emissions from Livestock Waste [ROG, PM, Ammonia]	IV-A, pp. E7-E13	IV-A Modification, p. M11
E-3	Control of Fugitive Dust from Agriculture [PM]	IV-A, pp. E14-E16	

Others

The 11 control measures proposed in this section could affect more than one source category. Examples include: requiring Best Available Retrofit Control Technology (BARCT) for all permitted sources, offsetting all growth in emissions from permitted sources, phasing-out liquid and solid fuel use, and permitting ammonia sources. Table 4-7 summarizes the measures in this group with notations that three measures have been adopted by the District during the Draft AQMP planning process. Appendices IV-A and IV-G provide detailed descriptions of these measures.

The total quantifiable emission reductions for this group are presented below:

	ROG	NOx	SOx	PM	CO
Emission Reduction (Tons/Day)	*78*	*39*	*20*	*182*	29

For those control measures with cost data, the total cost is $2.2 million/day. The emission reductions associated with measures with cost data are:

	ROG	NOx	SOx	PM	CO
Emission Reduction (Tons/Day)	*40*	*16*	*16*	*117*	10

TABLE 4-7

Tier I Control Measures-

Others

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum, No. Page No.
F-1	Installation of Best Available Retrofit Control Technology [All Pollutants]	IV-A, pp. F3-F5	IV-A, pp. 22-23
F-2	Uniform Commercial Quality Standard on Sulfur Content of Gaseous Fuels [SOx]	IV-A, pp. F6-F10	--------
F-3	Lower Limits on Sulfur Content of Stationary Liquid Fuels [SOx]	IV-A, pp. F11-F14	--------
F-4	Control of Fugitive Emissions from Construction of Roads and Buildings [PM]	IV-A, pp. F15-F17	IV-A Modification, p. M11
F-5	Control of Ammonia Emissions from Stationary Sources by Permits and Fees [Ammonia]	IV-A, pp. F18-F19	--------
F-6(1)	Control of Emissions from Exempt Equipment, [All Pollutants]	IV-A, pp. F20-F21	IV-A, p. 23
F-7(2)	Control of Emissions from Soil Decontamination [ROG]	IV-A, pp. F22-F24	IV-A, p. 23
F-8	New Source Review [All Pollutants]	IV-A, pp. F25-F27	IV-A, pp. 24-26; IV-A Modification, p. M11
F-9	Low Emission Materials for Building Construction [ROG, PM]	IV-A, pp. F28-F30	--------
F-10	Phase-Out Stationary Source Fuel Oil and Solid Fossil Fuel Use [NOx, SOx, PM]	IV-A, pp. F31-F34	IV-A, p. 27; IV-A Modification, p. M12
F-11	Emission Minimization Management Plan [All Pollutants]	--------	IV-A Modification, p. M13-M14

(1) Adopted on June 3, 1988 by the District.

(2) Adopted on August 5, 1988 by the District. Measure listed to account for emission reductions not included in emission forecast.

Transportation Sources

Motor Vehicles

The 19 control measures in this category are intended to reduce automobile and truck emissions through motor vehicle emission control systems. Air Resources Board (ARB) is primarily responsible for development and implementation of these measures. The ARB motor vehicle control program consists of three primary strategies: (1) reduction of excess emissions (i.e., emissions exceeding the vehicle emission standards), (2) stricter emission standards on new motor vehicles, and (3) alternative fuels (alternative fuels are discussed in Tier II). Additional control measures include alternative fuels for buses. Table 4-8 summarizes these measures. These measures are discussed in detail in Appendix IV-F, prepared by the ARB, and Appendix IV-A.

The estimated emission reductions for this group are shown below:

	ROG	NOx	SOx	PM	CO
Emission Reduction (Tons/Day)	136	239	2	10	1780

For those control measures with cost data, the total cost is $1.0 million/day. The emission reductions associated with measures with cost data are:

	ROG	NOx	PM	CO
Emission Reduction (Tons/Day)	136	138	8	1776

TABLE 4-8

Tier I Control Measures-

Motor Vehicles

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum, No. Page No.
	Improved Inspection and Maintenance and Elimination of Excess Emissions for Automobiles and Light and Medium Duty Trucks [ROG, NOx, CO]	IV-F. pp. 10-11	--------
	Add Heavy Duty Gasoline Vehicles to Inspection and Maintenance Program [ROG, NOx, CO]	IV-F, p. 10	--------
	Heavy Duty Vehicle Smoke Enforcement Program [ROG, NOx, PM]	IV-F, p. 13	--------
	Lower Gasoline Vapor Pressure Standard [ROG]	IV-F, p. 20	--------
	Lower ROG and CO Standards for Gasoline Light Duty Vehicles [ROG, CO]	IV-F, pp. 15-16	--------
	Lower ROG, CO and NOx Emission Standards for Medium Duty and Light Heavy Duty Trucks [ROG, NOx, CO]	IV-F, p. 16	--------
	Lower NOx Standard for Gasoline Light Duty Vehicles [NOx]	IV-F, p. 20	--------
	Lower NOx Standard for Heavy Duty Diesel Trucks [NOx]	IV-F, p. 20	--------
	Lower PM Emission Standard for Medium Duty and Light Heavy Duty Diesel Trucks [PM]	IV-F, pp. 16-17	--------
	Establish New Diesel Fuel Quality Standards [ROG, PM]	IV-F, p. 17	--------
	New Methanol - Fueled Buses [NOx, SOx, PM]	IV-F, p. 8	--------
	Retrofit Particle Traps on Heavy Duty Diesel Buses [PM]	IV-F, p. 19	--------
	Further Evaporative Control/Larger Canisters for All Gasoline Vehicles [ROG]	IV-F, p. 15	--------

TABLE 4-8
Tier I Control Measures-
Motor Vehicles
(Continued)

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum,No. Page No.
G-1	Urban Bus System Electrification [All Pollutants]	IV-A, pp. G3-G5	IV-A, pp. 27-28
G-2	Clean Fuel Retrofit of Transit Buses [NOx, SOx, PM]	IV-A, pp. G6-G8	--------
G-3	Use of Radial Tires on Light Duty Motor Vehicles[PM]	IV-A, pp. G9-G10	IV-A, p. 28
G-4	Clean Fuels in New Fleet Vehicles [All Pollutants]	IV-A, pp. G14-G20	--------
G-5[1]	Smoking Vehicle Enforcement Programs [ROG, NOx, PM]	--------	IV-A, pp. 34-36

(1) This measure is currently being implemented.

Transportation System and Land Use

The 20 control measures in this category are designed to lower automobile and truck emissions by reducing vehicle use (i.e., vehicle miles traveled and number of trips). Examples of these control measures include alternative work schedules, telecommuting, and improvements in traffic flow. These measures are elements of the SCAG Regional Mobility Plan (Appendix IV-H) and the SCAG Growth Management Plan (Appendix IV-I).

Table 4-9 summarizes the individual control measures. They are discussed in detail in Appendix IV-G, prepared by SCAG, and Appendix IV-A, prepared by the District. Various agencies, including the District, local government agencies, and some state agencies, are responsible for implementing these measures. Enabling legislation or additional funding would be required to implement some of these measures.

The emission reductions estimated for this group are shown below:

	ROG	NOx	SOx	PM	CO
Emission Reduction (Tons/Day)	120	166	19	498	1343

The estimates shown include the reductions in petroleum fuel distribution emissions that would result from these measures. The control cost for these reductions is uncertain. The Regional Mobility Plan proposed by SCAG to solve regional transportation problems would cost approximately $44 billion over the next twenty years due to transportation facility construction. $21 billion of the total public funding needed is expected to be available.

TABLE 4-9

Tier I Control Measures-

Transportation System and Land Use

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum, No. Page No.
H-1	Banning of New Drive-Through Facilities [ROG, NOx, CO]	IV-A, pp. H3-H4	IV-A, p. 37; IV-A modification, p. M15
1.a	Alternative Work Weeks and Flextime [ROG, NOx, CO]	IV-G, pp. 54-60	--------
1.b	Telecommunications [ROG, NOx, CO]	IV-G, pp. 61-73	--------
2.a	Employer Rideshare and Transit Incentives [ROG, NOx, CO]	IV-G, pp. 74-80	--------
2.b	Parking Management [ROG, NOx, CO]	IV-G, pp. 81-87	--------
2.c	Vanpool Purchase Incentives [ROG, NOx, CO]	IV-G, pp. 88-93	--------
2.d	Merchant Transportation Incentives [ROG, NOx, CO]	IV-G, pp. 94-100	--------
2.e	Auto Use Restrictions [ROG, NOx, CO]	IV-G, pp. 101-107	--------
2.f	HOV Facilities [ROG, NOx, CO]	IV-G, pp. 108-113	--------
2.g	Transit Improvements [ROG, NOx, CO]	IV-G, pp. 114-119	--------
3.a	Truck Dispatching, Rescheduling and Rerouting [ROG, NOx, CO]	IV-G, pp. 120-126	--------
3.b	Diverting Port-Related Truck Traffic to Rail [ROG, NOx, CO]	IV-G, pp. 127-132	--------
4	Traffic Flow Improvements [ROG, NOx, CO]	IV-G, pp. 133-137	--------
5	Nonrecurrent Congestion Relief [ROG, NOx, CO]	IV-G, pp. 138-148	--------

TABLE 4-9
Tier I Control Measures-
Transportation System and Land Use
(Continued)

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum,No. Page No.
7	Centralized Ground Power Systems [ROG, NOx]	IV-G, pp. 156-160	--------
8	Airport Ground Access [ROG, NOx, CO]	IV-G, pp. 161-168	---------
11	Rail Consolidation to Reduce Grade Crossings [ROG, NOx, CO]	IV-G, pp. 180-185	--------
13	Freeway & Highway Capacity Enhancements [ROG, NOx, CO]	IV-G, pp. 197-201	IV-G Modification, p. M25
16	High Speed Rail [ROG, NOx]	IV-G, pp. 219-223	--------
17	Growth Management [ROG, NOx, CO]	IV-G, pp. 224-231	IV-G Modification, p. M25

Off-Road Vehicles

The 13 control measures in this category are designed to reduce emissions from railroads, boats and ships, construction equipment, and aircraft by restricting the use of, and setting stricter emission standards on, these vehicles. Table 4-10 summarizes these measures. They are discussed in detail in Appendix IV-A, Appendix IV-F, and Appendix IV-G. Various agencies, including the District, local government agencies, and some state agencies, are responsible for implementing these measures. Enabling legislation or additional funding would be required to implement some of these measures.

The total emission reductions estimated for this group are:

	ROG	NOx	SOx	PM	CO
Emission Reduction (Tons/Day)	45	70	21	8	279

For those control measures with cost data (i.e., ships and boats), the total cost is $240,000/day. The emission reductions associated with measures with cost data are:

	ROG	NOx	SOx	PM	CO
Emission Reduction (Tons/Day)	33	16	18	0.4	190

TABLE 4-10

Tier I Control Measures-

Off Road Vehicles

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum, No. Page No.
I-1	Control of Emissions from Ship Berthing Facilities [NOx]	IV-A, pp. I3-I5	--------
I-2	Lower Emission Standards on New Jet Aircraft Engines [ROG, NOx]	IV-A, pp. I6-I9	--------
I-3	Control of Fugitive Emissions from Marine Vessel Tanks [ROG]	IV-A, pp. I10-I16	--------
I-4	Control of Emissions from Marine Diesel Operations [NOx]	IV-A, pp. I17-I20	--------
I-5	Limit on Sulfur Content of Marine Fuel Oils [SOx]	IV-A, pp. I21-I25	--------
I-6	Control on Switching Locomotives [All Pollutants]	IV-A, pp. I30-I34	IV-A, p. 45
I-7	Control of Emissions from Utility Equipment [All Pollutants]	IV-A, pp. D21-D25	IV-A, pp. 21-22 IV-A Modification, p. M15
6	Aircraft and Ground Service Vehicles [ROG, NOx, CO]	IV-G, pp. 149-155	--------
9	Replacement of High Emitting Aircraft [All Pollutants]	IV-G, pp. 169-174	--------
10	General Aviation Vapor Recovery [ROG]	IV-G, pp. 175-179	---------
14	Railroad Electrification [All Pollutants]	IV-G, pp. 202-208	---------
*	Emission Standards for New Heavy Duty Construction Equipment [ROG, CO]	IV-F, pp. 20-21	--------
*	Emission Standards for Off-Road Motorcycles [ROG, CO]	IV-F, p. 21	--------

* No Control Measure Number Assigned.

TIER II CONTROL TARGETS

Introduction

Tier II requires further advancement or improvement of existing Ozone and PM_{10} control technologies. Tier II is expected to be implemented in the next ten to fifteen years. In some cases, new technological applications not presently on the market are required, but these could be expected to develop through continuous improvements and refinements to products currently available. Regulatory intervention is employed whenever necessary to expedite commercialization of new products and to mitigate future emission growth. Tier II also includes measures which require additional funding and/or legislative authority.

Tier II measures reduce emissions by:

> **Extending current technological applications beyond the levels traditionally pursued;**
>
> **Introducing regulatory intervention through technology-forcing standards or emission charges;**
>
> **Developing strong enforceable public and private commitments for the required implementation actions, including additional funding and/or legislative authority as necessary**

Table 4-11 summarizes the control measures and goals for Tier II. Appendix IV-A contains more detailed descriptions of the proposed measures. Additional emission reductions resulting from the application of Tier II controls are shown in Table 4-12. As presented in Chapter 5, Tier I and Tier II measures would not result in attainment of the ozone standards, although there would be significant improvements in ozone levels. Major and more fundamental technological breakthroughs and infrastructure investments not anticipated to occur in Tier II will be required to achieve these standards.

TABLE 4-11
Tier II Control Measures and Goals

Sources	Approach	Goal
Transportation	*Low Emitting* Light & Medium Duty Vehicles	40% Penetration
	Low Emitting Freight Vehicles	70% Penetration
	Low Emitting Transit Buses	100% Penetration
	Stricter Emission Standards for Off-Road Vehicles	50% Reduction of Remaining Emissions After Tier I
Surface Coating and Solvent Use	Low ROG Consumer Products	50% Reduction of Remaining Emissions After Tier I
	Low ROG Coating Applications	50% Reduction of Remaining Emissions After Tier I
Stationary	Emission Charges	Emission Minimization
	More Stringent Control Technology	Emission Minimization

TABLE 4-12
Summary of Tier II Emission Reductions

Sources	Pollutant (Tons/Day) ROG	NOx	CO	SOx	PM
Year 2010 Baseline After Tier I	*513*	*432*	*1600*	*63*	*1314*
Tier II Emission Reductions					
Stationary	*133*	*25*	*15*	*6*	*208*
Transportation +	*15*	*82*	*305*	10	*4*
Total	*148*	*107*	*320*	*16*	*212*
Year 2010 Remaining Emissions After Tier II	*365*	*325*	*1280*	47	*1102*

\+ Emission reductions do not reflect recent changes in on-road mobile sources emission inventory. However, the impact of such changes on emission reductions in mobile source category would be minor and would not change the overall AQMP results.

The following sections highlight approaches to achieving the Tier II goals. The costs for Tier II measures cannot be fully estimated because cost figures for yet-to-be commercialized products have not been developed. However, extensions of existing technology can be considered to fall within the range of similar measures in Tier I. The control cost would be mostly borne by the private sector and indirectly by consumers. The additional public funding needed for the SCAG Regional Mobility Plan is roughly $2*3* billion.

Transportation Sector

The goals established for the transportation sector in Tier II are:

> **Achieving 40-percent use of <u>low emitting</u> passenger vehicles;**
>
> **Achieving 70-percent use of <u>low emitting</u> freight vehicles;**
>
> **Achieving 100-percent use of <u>low emitting</u> transit buses;**
>
> **Achieving 50-percent reduction of the remaining off-road vehicle emissions after implementing Tier I;**

Achieving these specified levels requires that 40 percent of new passenger vehicles and 70 percent of new freight vehicles *use low emitting vehicle technologies by 2000. All diesel transit buses* and off-road vehicles would be subject to stricter emission standards as well. *Control of emissions from pleasure boats is included in this tier. The "low emitting technology" defined in Tier II includes all emission control technologies as well as all fuels, that on an equal Btu basis, produce lower levels of ROG, NOx, CO, and PM emissions compared to conventional fuels and are at least as clean as methanol when burned in an internal combustion engine, turbine, boiler, or other devices as appropriate.* The on-going District Clean Fuel Program and ARB regulatory activities can facilitate the commercialization of *low emitting vehicle technologies* to achieve the specified goals. *Other impacts such as health hazards and safety issues related to material handling, storage, and transportation, will be further examined during the course of selection of candidate technologies and/or fuels.* Descriptions of *examples of low emitting* vehicles are contained in Appendices IV-A, IV-E, IV-F, and IV-G. *Technologies not described in these appendices yet capable of achieving equivalent emission reductions are in essence included in the Plan. The District in conjunction with ARB, SCAG, and other appropriate agencies will continue*

to perform additional analyses to develop and identify qualified low emitting technologies.

The total Tier II emission reductions from the transportation sector are targeted to be:

	ROG	NOx	SOx	PM	CO
Emission Reduction (Tons/Day)	*17*	*82*	10	*4*	*306*

Surface Coating and Solvent Use

The Tier II goal for the surface coating and solvent use category is:

> **Achieving 50-percent reduction of the remaining ROG emissions after implementing Tier I.**

Consumer products with lower ROG content can be formulated and marketed in the Basin through some regulatory intervention (e.g., emission charges, more stringent emission limits). Alternative propellants or dispensing mechanisms can also reduce ROG emissions from consumer products. Strong public commitments are needed to enhance the marketability of the new products. Cooperation with ARB and EPA can facilitate statewide implementation of regulations to reduce reactive solvent contents in consumer products. In coating operations, high transfer efficiency applications techniques (i.e., electrostatic spray guns), in conjunction with coating automation (i.e., robotic methods) or operating modifications (i.e., ultraviolet curable coatings, catalytic curable coatings), can be adopted for a wider range of coating processes to achieve the specified goal. Specific control approaches are discussed in detail in Appendix IV-A.

The ROG emission reductions estimated for this source category is 116 tons/day.

Stationary Sources

Further control of emissions from stationary sources is aimed at:

Minimizing existing emissions, as well as potential emission growth.

The emission reduction target is to reduce the remaining fuel combustion emission after Tier I by 50 percent. This goal could be achieved by imposing more stringent emission standards on stationary sources through implementation of the Best Available Control Technology (BACT) on new sources and the Best Available Retrofit Control Technology (BARCT) on existing sources. Control of PM emissions would focus on paved road dust. Extensive studies are needed to develop control methods on this source category. Emission charges can also be used to control emission sources, such as commercial and household use of solvents, and construction dust. Manufacturing activities which serve market demand outside the Basin are also targets. For instance, petroleum products which are refined in the District but are exported outside of Southern California could be taxed. This would potentially reduce in-basin refinery emissions by 20 percent by making out-of-basin production more attractive. Emission charge measures do not, by themselves, reduce emissions, but they do provide economic incentives to encourage development of less polluting technologies.

The Tier II emission reductions expected from stationary sources would be:

	ROG	NOx	SOx	PM	CO
Emission Reduction (Tons/Day)	*16*	*24*	*6*	*207*	*16*

TIER III TECHNOLOGICAL BREAKTHROUGHS

Introduction

Tier I and Tier II programs achieve the necessary CO, NOx, SOx, and PM10 emission reductions to meet health standards. Further ROG reductions are still needed in order to fully achieve the ozone standard. Tier III programs are thus primarily designed to bring about technological breakthroughs to further reduce ROG emissions. These programs are directed at the sectors where significant emissions still exist after implementation of Tiers I and II.

Tier III programs include:

> **Solvents and Coatings in industrial, commercial, and residential applications.**
>
> **Remaining petroleum based-fuel use in stationary and mobile applications.**
>
> **Development of contingency controls, if a shortfall of emission reductions exists.**

Unlike Tier II, which focuses on further strengthening known emission controls, Tier III calls for efforts to develop new technology to reduce remaining emissions. Table 4-13 summarizes possible Tier III control strategies. Potential emission reductions provided by these control strategies are summarized in Table 4-14.

Strategies needed to achieve these emission reductions are discussed in the following sections. Technical developments, research efforts, and legislation needed to implement the solvent and energy strategies are described in Appendices IV-B and IV-C, prepared by the District.

TABLE 4-13
Possible Tier III Control Strategies

Non-Reactive Solvents for Surface Coatings and Solvent Use
Extremely Low Emitting Passenger Vehicles
Extremely Low Emitting Heavy Duty Vehicles

TABLE 4-14
Summary of Tier III Emission Reductions

Sources	Pollutant (Tons/Day) ROG	NOx	CO	SOx	PM
Year 2010 Baseline After Tier II	*365*	*325*	*1280*	47	*1102*
Tier III Emission Reductions					
Stationary	*107***	*2**	*2**	*3**	*2**
Transportation+	*76*	*119*	*1094*	*14*	*5*
Total	*183*	*121*	1096	17	*7*
Year 2010 Remaining Emissions After Tier III	*182*	*204*	*184*	30	*1095*

* Emission reductions are due to controls on transportation sources.
** 15 tons/day are contributed by controls on transporation sources.
\+ Emission reductions do not reflect recent changes in on-road mobile sources emission inventory. However, the impact of such changes on emission reductions in mobile source category would be minor and would not change the overall AQMP results.

Surface Coating and Solvent Use

Further improvement in water based solvents and coatings, ultraviolet curable coatings, two-component coatings, and non-reactive solvents, along with the prohibition of certain high-emitting, uncontrollable coating processes, offers the promise of near complete elimination of reactive solvents. Appendix IV-C contains a description of a possible program.

In this regard, the formation of a cooperative task force comprising District, ARB and/or EPA, citizen and industry representatives to fully assess the constraints and options involved with a final assault on solvents and coatings is mandatory.

Research and development of low-or non-ROG products and processes will be required, with additional technical consultation and evaluation provided by the District's newly formed Office of Technology Advancement.

Development of legislative policy regarding economic incentives, such as emission charges or tax credits as proposed in Tier I and Tier II, to encourage or enhance the timely adoption of new technologies by industry, will continue to be an important component of this strategy. These incentives can encourage maximum use of non solvent-based systems.

The Tier III emission reduction potential realized from eliminating reactive solvents (ROG) in coating and solvent use and consumer products can approach 92 tons/day.

Extremely Low Emitting Vehicles

Passenger Vehicles

Even though Tiers I and II involve significant introduction of *low emitting* vehicles, recent progress with respect to fuel cells, solar cells, storage batteries, and superconductors offers the promise of eliminating combustion processes in the Basin almost entirely. As is the case for solvent technology, significant technological leadership will be needed in the Basin. *The "extremely low emitting vehicles" defined in Tier III would be essentially emission free. Any technologies or fuels which can achieve equivalent or better emission reductions are part of the proposed options.*

The estimated emission reduction potential, *assuming electric technology is chosen*, including the elimination of emissions from petroleum production, refining, and distribution, is:

	ROG	NOx	SOx	PM	CO
Emission Reduction (Tons/Day)	*88*	*90*	*11*	*4*	1023

Other Vehicles

The Tier III strategy would require that all mobile sources *except passenger vehicles*, such as heavy duty trucks, motorcycles and small recreational vehicles, be *operated by low emitting technologies.* Stringent vehicle emission standards, such as methanol equivalent or better, can facilitate greater penetration of *low emitting* vehicles.

The emission reductions estimated for the additional use of *low emitting* vehicles in Tier III are:

	ROG	NOx	SOx	PM	CO
Emission Reduction (Tons/Day)	*0.3*	31	6	2	73

Summary

The expected emission reductions from implementation of this three-tiered control strategy are summarized in Table 4-15.

ENERGY FUTURE

Electricity is considered as a low emitting technology in the Plan. It could be used in every tier to replace certain portions of fossil fuel combustion in both stationary and mobile sources. If electric technology is selected to achieve the required emission reductions, the Plan will increase electricity demand. Table 4-16 shows the electrical energy need and capacity demand by 2010 for each tier, if electrification is chosen.

TABLE 4-15

Summary of Emission Reductions

By Tiers+

Source	Pollutants (Tons/Day) ROG	NOx	CO	SOx	PM
Year 2010 Baseline	1130	1017	4467	140	2426
Tier I Reductions	617	585	2867	77	1112
Year 2010 Remaining Emissions After Tier I	513	432	1600	63	1314
Tier II Reductions	148	107	320	16	212
Year 2010 Remaining Emissions After Tier II	365	325	1280	47	1102
Tier III Reductions	183	121	1096	17	7
Year 2010 Remaining Emissions After Tier III	182	204	184	30	1095

+ Emission reductions do not reflect recent changes in on-road mobile sources emission inventory. However, the impact of such changes on emission reductions in mobile source category would be minor and would not change the overall AQMP results.

Table 4-16 Energy Forecast for Potential AQMP Electrification Strategy[(1)] (year 2010)

Control Measures[(2)]	*Energy(GWh/Yr)*	*Capacity(MW) AM*	*PM*
Tier I	*2,500*	*300*	*200*
Tier II	*18,000*	*1,400*	*2,700*
Tier III	*40,000*	*2,700*	*6,300*
Total	*60,500*	*4,400*	*9,200*

(1) This table assumes selection of electric technology to achieve the required emission reductions. If other technologies are chosen, the energy demand could be less than the estimates shown here.

(2) Measures which can use electric technologies include--Tier I: I/C engines, utility equipment, cold ironing, transit buses, and railroads. Tier II targets: Reducing the remaining emissions from industrial fuel combustion sources after Tier I by 50 percent; 20 percent passenger electric vehicles (@ 0.75 kwh/mile). Tier III goals: 100 percent passenger electric vehicles (@ 0.5 kwh/mile).

To avoid the emission trade-offs between fuel combustion and power generation, and to assure that the added electrical energy demand can be met, the following energy *strategy* would be pursued:

Implementation of in-basin energy conservation *by all sources (e.g., residential, commercial, industrial, and mobile sources);*

Promotion of advanced energy conservation technologies (e.g., solar heating, super energy efficient equipment);

Promotion of non-polluting power generating technologies (e.g., solar, fuel cells);

Implementation of load management techniques to utilize both in-basin and out-of-basin off-peak excess power generating capacities ;

Promotion of energy efficient power generating technologies (e.g., advanced combined cycles).

An evaluation of available energy resources in accordance with the outlined energy strategy indicates that the added power demand caused by electrification measures could potentially be met without constructing any new fossil fuel power plants. Table 4-17 shows a preliminary supply matrix to demonstrate capacities potentially available from selected energy resources. As indicated in Table 4-17, the capacity demand created by Tier I and Tier II controls can be met by energy conservation measures and solar technology. Tier III's demand, due mostly to use of electric vehicles would depend heavily upon excess off-peak capacities from both in-basin and out-of-basin existing units. Since electric vehicles could be charged either during the day or at night, effective load management programs should be instituted to optimize the demand and supply matrix. It should also be noted that the most effective means to reduce energy consumption by electric vehicles will be reduction in vehicle miles traveled (VMT) and improvement in vehicle performance, which also needs to be pursued on a continuous basis.

Table 4-17
Potential Power Supply Matrix for the Basin

	Capacity(MW) AM	Capacity(MW) PM
Demand	*4,400*	*9,200*
Supply		
In-Basin:		
Conservation	*1,900*	*900*
Solar Power	*1,500 - 2,000*	
Solar/Fuel Cell EVs(1)	*300 - 1,000*	
Off-peak Excess		*1,000 - 2,000*
Fuel Cells	*500 - 1,000*	*500 - 1,000*
Repowering		*500 - 1,000*
Out-of-Basin:		
Hydropower		*500 - 1,500*
Off-peak Excess		*3,000 - 4,000*
Geothermal	*500 - 1,000*	*500 - 1,000*
Thermally Enhanced Oil Recovery(2)	*1,000 - 2,000*	*1,000 - 2,000*

(1) Use of solar or fuel cell-powered EVs can reduce burden on the utility systems.
(2) Cogeneration projects.
(3) This table was developed in consultation with California Energy Commission.

CONTINGENCY MEASURES

As indicated in the beginning of this chapter, all measures proposed in this draft plan are needed to meet the attainment goals. However, many factors can affect realization of the expected emission reductions, including, but not limited to, technical readiness, public funding availability, and commitments from other governmental agencies. Therefore, should certain control measures in the draft plan fail to be implemented or not be as effective as expected, additional emission reductions will be needed. As a result, Table 4-18 lists measures which may help provide those reductions. Appendix IV-A, prepared by the District, and Appendix IV-G, prepared by SCAG, provide a more detailed discussion of these measures.

TABLE 4-18
Contingency Measures

AQMP Measure No.	Title	AQMP Appendix No., Page No.	AQMP Addendum,No. Page No.
T-1	Emission Charges on Gasoline and Diesel Fuels Used by Motor Vehicles [All Pollutants]	--------	IV-A, pp. 29-33
T-2	Control of Vehicle Registration [All Pollutants]	IV-A, pp. H5-H7	--------
T-3	Emission Charges on Parking Lots [All Pollutants]	--------	IV-A, pp. 38-41
T-4	Emission Charges on Vehicle Use [All Pollutants]	--------	IV-A, pp. 42-44
T-5	Reduction of VMT to 1985 Levels [All Pollutants]	IV-A, pp. I13-I14	--------
T-6	User Fees [All Pollutants]	IV-G, pp. 285-291	--------
T-7	Oxygenated Fuels Program [CO]	--------	IV-A Modifications, pp. M16-M19
T-8	Time and Place Control Measures [All Pollutants]	--------	IV-A Modifications, pp. M20

CHAPTER 5

FUTURE AIR QUALITY

Introduction
Air Quality Projection Summary
Three-step Modeling Process
Modeling Approach and Analysis
Air Quality Impacts of Plan in Year 2000
Basin Emission Carrying Capactiy

INTRODUCTION

Predictions of future air quality depend on the use of models. These models are used to estimate the effectiveness of various control scenarios and the level of emission controls required to meet the ambient air quality standards. Different modeling techniques were developed and applied for ozone, PM10, nitrogen dioxide, and carbon monoxide. These modeling techniques were first used to estimate the baseline air quality for the years 2000 and 2010, considering all future growth and existing regulations. The techniques were then used to evaluate control strategy effectiveness of Tier I, Tier II, and Tier III controls for the year 2010. The air quality impacts with maximum implementation of Tier I plus Tier II control measures for the year 2000 are also estimated using the modeling techniques.

The modeling techniques for PM10 and ozone represent the application of state-of-the-art modeling to the South Coast Air Basin. The ozone modeling analyses performed to date are suitable for use for estimating impacts of emission reductions on peak days and for an approximate estimate of ozone exposure on the peak day. Additional uses of both the PM10 and ozone models will be defined after full evaluation of the current and other available episodes. Detailed information on the modeling approach, data gathering, modeling technique development and application, and results interpretation are incorporated into 20 appendices (V-A to V-T). The uncertainties inherent in modeling techniques and input data should be considered when reviewing modeling results.

AIR QUALITY PROJECTION SUMMARY

Figure 5-1 illustrates the model-predicted basinwide peak concentrations, as percentages of the most stringent federal standard, for the four pollutants for the 1985, 2000, and 2010 baseline scenarios and the Tier I, Tier II, and Tier III control scenarios applied for the year 2010. Figure 5-2 shows similar information related to the most stringent California state standards.

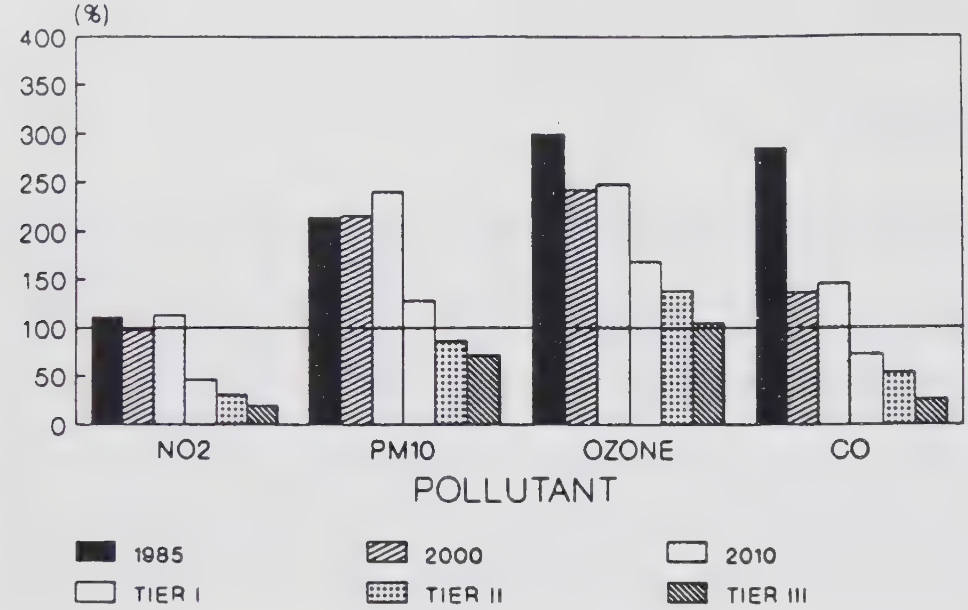


FIGURE 5-1

Projection of Future Air Quality in the South Coast Air Basin
in Comparison with the Most Stringent Federal Standards

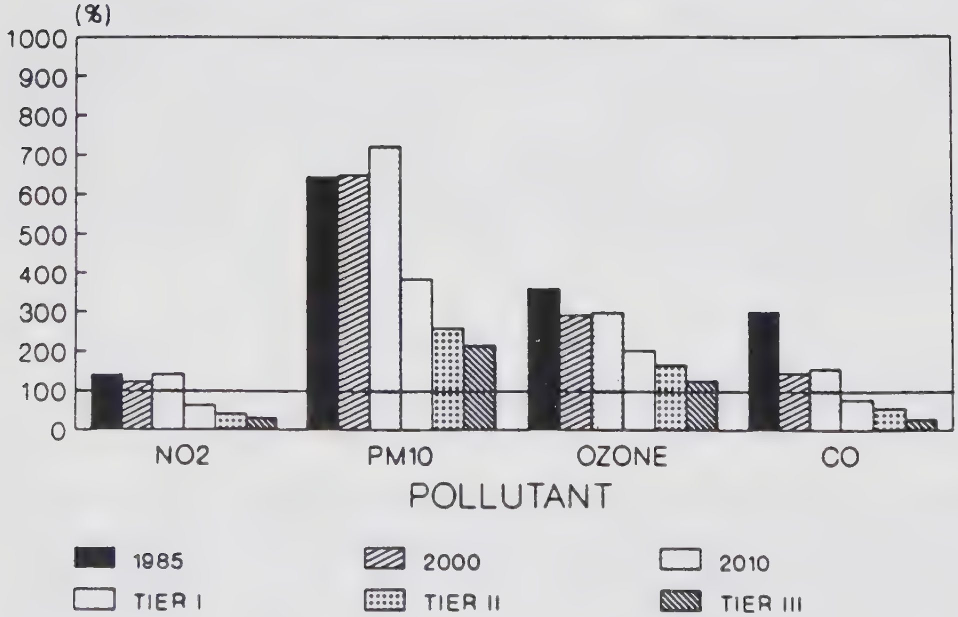


FIGURE 5-2

Projection of Future Air Quality in the South Coast Air Basin
in Comparison with the Most Stringent California State Standards

The modified rollback modeling results indicate that Tier I control measures would bring the entire Basin into compliance with all the federal and state standards for carbon monoxide (CO).

The NO_2 modeling results indicate that the Basin would not be able to meet the federal annual and state one-hour average NO_2 standards in 2010 with the existing control program and projected growth. However, the entire Basin would comply with the federal standard with implementation of Tier I control measures.

The PM10 modeling results indicate that Tier I control measures would not bring the entire Basin into compliance with either the federal annual or the federal 24-hour average PM10 standards in 2010. The Tier II control scenario in 2010 would be needed to comply with both federal standards. Because nitrates contribute a large portion to the maximum 24-hour PM10 concentrations, the NO_X emissions reduction requirement can not easily be replaced with other control measures. The California PM10 standards will only be met if technology is pushed further than envisioned for Tier III control.

The Urban Airshed Model (UAM) results indicate that the Basin would not meet the ozone standards in 2010 with implementation of the Tier I plus Tier II control measures. Tier III control measures, which include a further ninety percent reduction of ROG from solvents and coatings, and total conversion of the vehicle fleet to clean fuels, would bring the Basin very close to compliance with the federal standard. Meeting the state ozone standard will require technology advancements beyond solvent substitution and clean fuels. There is significant uncertainty in UAM predictions at low ozone concentrations. Further study is required to determine if, or how much, additional control would be required. These UAM results were derived from model simulations which included the following recent modifications: (1) new ROG speciation profile for mobile source emissions, (2) revised treatment of boundary conditions, (3) source-category specific formaldehyde emission estimates, and (4) diurnal temperature adjustment for mobile source emissions. A detailed description of these modifications is included in Appendix V-S.

The modeling results indicate that with maximum implementation of Tier I and Tier II control measures in the year 2000, the Basin would meet all the federal and state standards for carbon monoxide and nitrogen dioxide. The Basin would also meet the federal annual and 24-hour PM10 standards, but

could fall short of the state PM10 standards. Stage I Episodes for ozone would be virtually eliminated and the basinwide average per-capita ozone exposure above the federal standard would be reduced by 90 percent compared to 1985.

THREE-STEP MODELING PROCESS

The District's goal is to formulate an integrated control strategy which will ensure that ambient air quality standards for all criteria pollutants be met by 2007 and which will achieve the maximum possible reduction in excess exposure to PM10 and ozone over the next ten years. The overall control strategy should be designed so that efforts to achieve the standard for one criteria pollutant would not cause deterioration of another. In order to achieve this objective, a three-step modeling approach was used to determine the adequacy of different control scenarios to meet the Board's adopted attainment goals.

Step 1 - NO2 Modeling

The annual NO_X model developed at the District indicated that although existing controls will allow the Basin to meet the federal annual standard for NO_2 by 1994, they are not sufficient to ensure continued compliance everywhere in the Basin with the NO_X emissions projected for the years 2000 and 2010. The modeling techniques were used to determine what additional NO_X controls would be required to ensure maintenance of the federal annual NO_2 standard. Additional NO_X controls are needed to bring the Basin into compliance with the state one-hour average NO_2 standard.

Step 2 - PM10 Modeling

The Chemical Mass Balance (CMB) receptor model was used to determine the contribution of various source categories to the directly emitted components of ambient PM10 concentrations monitored at various sites throughout the Basin. The PM10 dispersion model developed at the District was used to determine the contribution of various source categories to the secondary components of PM10 concentrations. The modeling results, together with the future emissions data for NO_X, SO_X, and directly emitted

PM10, were used to estimate the resulting PM10 air quality for various control scenarios. The minimum level of NO_X control was determined by the need to meet PM10 standards. The need for further NO_X control was determined based on requirements for achieving ozone air quality standards.

Step 3 - Ozone Modeling

Because of the non-linear relationship between precursor emission reductions and ozone air quality improvement, the urban airshed model (UAM) was used to determine the most effective strategies for improving ozone air quality. With assistance from Systems Applications, Incorporated (SAI), ARB, and EPA, the District developed the input data and evaluated the model for the June 5-7, 1985 episode. The model was used to determine future ozone levels in the years 2000 and 2010 without further controls and for the year 2010 under Tier I, Tier II, and Tier III control scenarios. Results from these UAM runs, as well as those derived from a number of sensitivity runs, were used to formulate additional control scenarios. The model was then applied to demonstrate the effectiveness of these control scenarios in achieving compliance with the ozone standard. The effect of maximum implementation of Tier I and Tier II control measures for the year 2000 was also estimated to assess the benefits of the controls in the next ten years.

MODELING APPROACH AND ANALYSIS

Nitrogen Dioxide

The District's annual average NO_X model was developed to estimate the contribution of individual source categories of NO_X emissions to measured NO_2 concentrations at air monitoring stations. Appendix V-A documents, in detail, the annual NO_2 modeling efforts.

Figure 5-3 displays the contributions of various source categories to annual average NO_2 concentrations in the year 2010 at key monitoring stations. It is clear that these source categories contribute quite differently to NO_2 concentrations at various stations in this Basin. It is also apparent that the annual average NO_2 standard would not be met in 2010 with existing

regulations and projected growth. Figure 5-4 displays the annual average NO_2 concentrations under baseline emissions in 1985, 2000, and 2010, and for 2010 under Tier I, Tier II, and Tier III control scenarios at the key monitoring stations. Figure 5-4 shows that the entire Basin can comply with the federal annual NO_2 standard after implementation of the Tier I control scenario.

PM10

The South Coast Air Basin has been classified by EPA as a PM10 Group I area, which is a designation for areas with a greater than 95 percent probability of not complying with the federal PM10 standards. Because of the multi-component nature of PM10 air quality and the sources which contribute to PM10 concentrations, several data gathering and modeling efforts were conducted to determine the contribution of various sources and to project future PM10 concentrations in this Basin.

Appendix V-B outlines the modeling approach used for PM10 analysis. Both receptor and dispersion models were used to estimate the contribution of various source categories to ambient PM10 at different monitoring sites. The Chemical Mass Balance (CMB) receptor model technique was used to assess the contribution of various sources of directly emitted (primary) PM10 species. A particle-in-cell Lagrangian dispersion model was used to apportion sources of secondary species, including sulfates and nitrates. The modeling results were used, together with emissions projections, to determine future PM10 air quality for a given baseline or specific control scenario. Detailed information on the data gathering and modeling analysis for PM10 are included in Appendices V-C through V-O.

Figures 5-5 and 5-6 present the CMB modeling results on the source apportionment for annual average and maximum 24-hour average PM10 concentrations in 1986 at five monitoring stations. These five stations have concurrent monitoring data in 1986 for concentrations of PM10 mass,

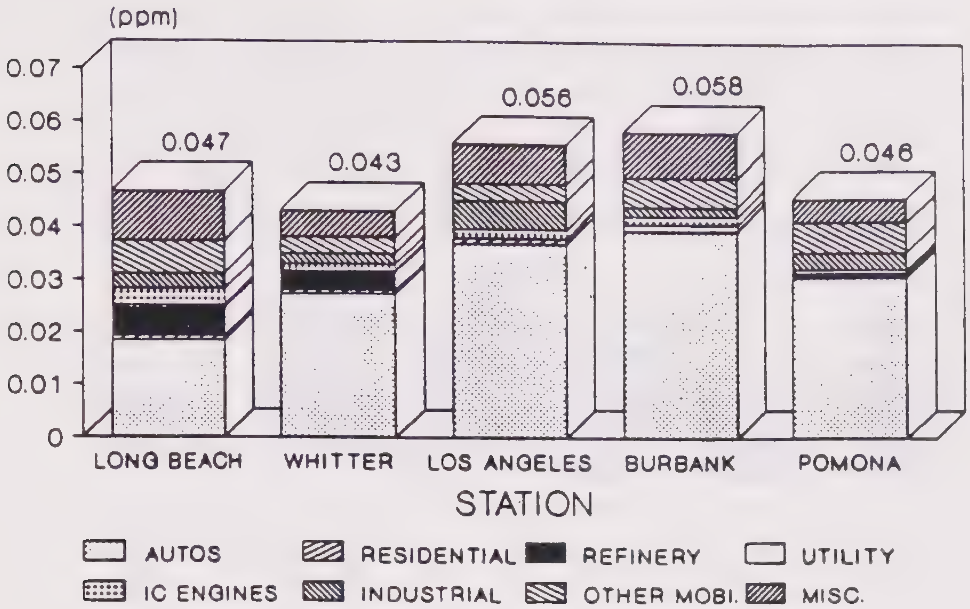


FIGURE 5-3

Source Contribution To 2010 Projected Annual Average NO_2 Concentrations in the South Coast Air Basin

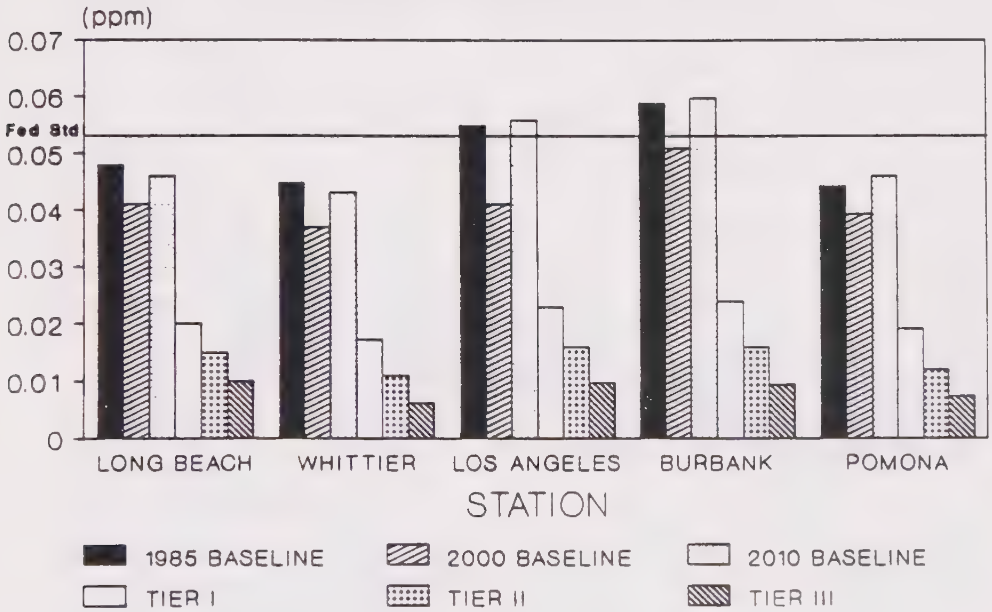


FIGURE 5-4

Annual Average NO_2 Concentration Projections in the South Coast Air Basin

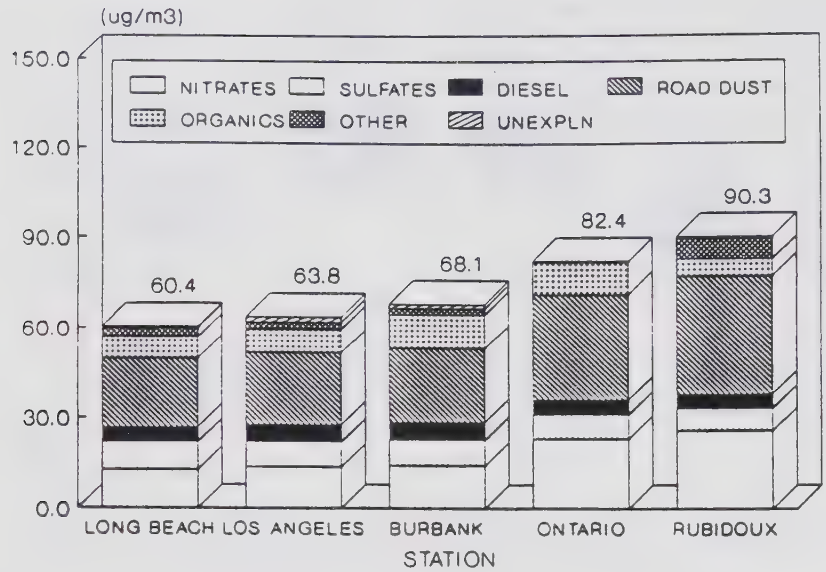


FIGURE 5-5

Source Apportionment of 1986 Annual Average PM10 Concentrations in the South Coast Air Basin

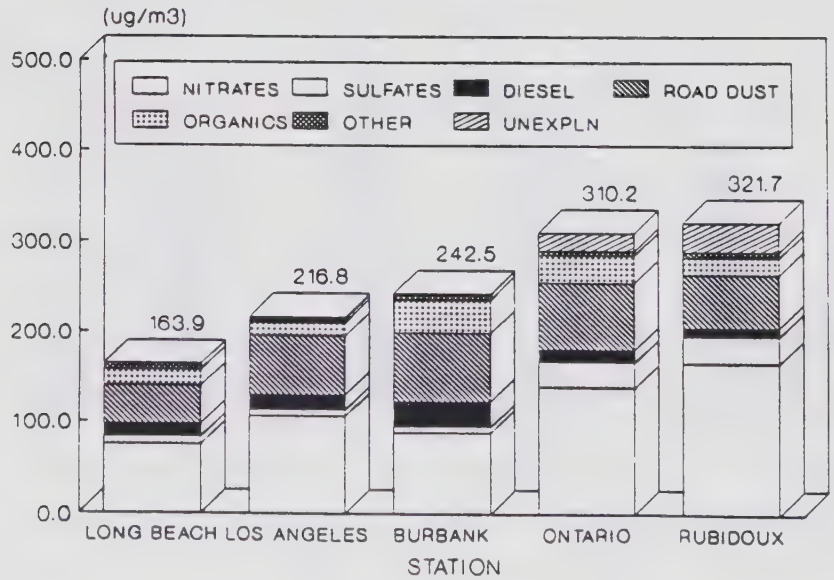


FIGURE 5-6

Source Apportionment of 1986 Maximum 24-Hour PM10 Concentrations in the South Coast Air Basin

nitrates, and sulfates gathered by District, and detailed PM10 species data gathered in a special contracted monitoring program. As shown in these two figures, Rubidoux has the highest annual average and the highest 24-hour average PM10 concentrations. At this site, secondary PM10 species were about 40 percent of the annual average PM10 concentrations and about 60 percent of the maximum 24-hour average PM10 concentration.

For both annual average and maximum 24-hour average PM10 concentrations at Rubidoux, nitrates, sulfates, organic aerosols, paved road dust, and diesel automobiles were the major contributors. The PM10 dispersion model was used to further apportion the sulfate and nitrate concentrations to various source categories.

Figures 5-7 and 5-8 depict future PM10 air quality projections at these five stations under 1985, 2000, and 2010 baseline emissions, and for 2010 with Tier I, Tier II, and Tier III control scenarios for both annual average and maximum 24-hour concentrations. These figures indicate that both the federal annual and 24-hour average standards would not be met under the Tier I control scenario in 2010. Tier II control scenarios will be needed to bring the entire Basin into compliance with the federal standards. However, the Basin will not be able to meet the state standards in 2010 even with Tier III control.

Ozone

The District has developed a statistical approach for characterizing meteorological conditions in terms of ozone formation potential. It selected ozone episodes for model simulation based on this approach (see Appendix V-P). Four 3-day episodes in 1985 which include the worst case day and have multiple coverage for the four meteorological classes were selected. Only the worst case episode (June 5-7, 1985) is used in this AQMP Revision to demonstrate the standard compliance. Appendix V-Q is the modeling protocol developed specifically for the AQMP and Appendix V-R documents the UAM performance for this ozone episode. Model performance for this episode meet and exceed all the criteria specified in the protocol. A sensitivity run using zero emissions produced a maximum ozone concentration of 0.06 ppm for this episode. The initial and boundary

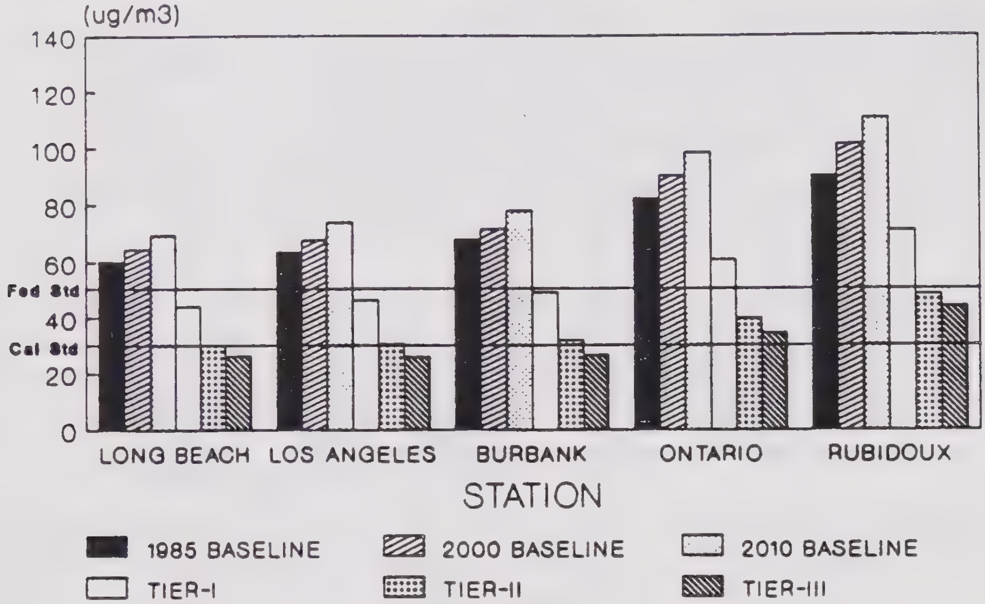


FIGURE 5-7

Annual Average PM10 Air Quality Projection
in the South Coast Air Basin

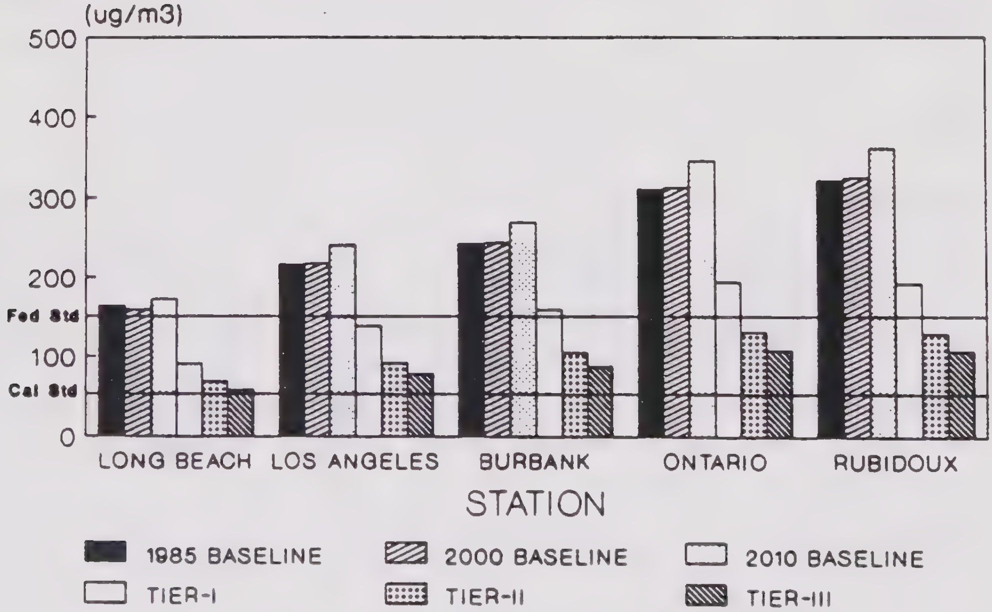


FIGURE 5-8

Maximum 24-Hour PM10 Air Quality Projection
in the South Coast Air Basin

conditions proved to be insignificant (less than 0.01 ppm difference between high and low cases) to model predictions for this zero-emission simulation.

Baseline Changes

Figures 5-9 and 5-10 display the basinwide maximum hourly ozone concentrations predicted for 1985 and 2010, respectively. Figure 5-11 displays the changes in maximum ozone concentrations between 1985 and 2010. Emission reductions between 1985 and 2010 are projected to be 200 tons/day for ROG emissions and an insignificant change in NO_X emissions (see Table 5-1). The modeling results indicate that there is a significant difference in the spatial pattern of ozone concentrations. There is considerable improvement (up to 0.11 ppm) in Los Angeles and Orange counties and some deterioration in the inland areas. The basinwide peak would be shifted eastward and would be lowered by about 0.06 ppm.

With the projected growth and existing controls, there will be a 20 percent reduction in ROG emissions and an 11 percent reduction in NO_X emissions between 1985 and 2000, and peak ozone concentrations would be reduced by 0.07 ppm. Ozone air quality would improve greatly in Los Angeles and Orange counties, with no significant deterioration in the inland areas. Basinwide ROG and NO_X emissions are projected to increase by 7 and 11 percent, respectively, between 2000 and 2010. However, the change in ozone air quality between 2000 and 2010 would not reverse the 1985-2000 change. Emission increases between 2000 and 2010 would not have a significant impact on ozone air quality in Los Angeles and Orange counties, but would cause 0.01 to 0.03 ppm deterioration in inland areas. The basinwide average per-capita ozone exposure is estimated to decrease by 15 percent between 1985 and 2010.

Control Strategy Changes

Figure 5-12 displays the modeling results at a number of key ozone monitoring stations under 1985, 2000, and 2010 baseline, and for 2010 under Tier I, Tier II, and Tier III control scenarios. Table 5-1 lists the episode-specific ROG and NO_X emission estimates, the model-predicted peak ozone

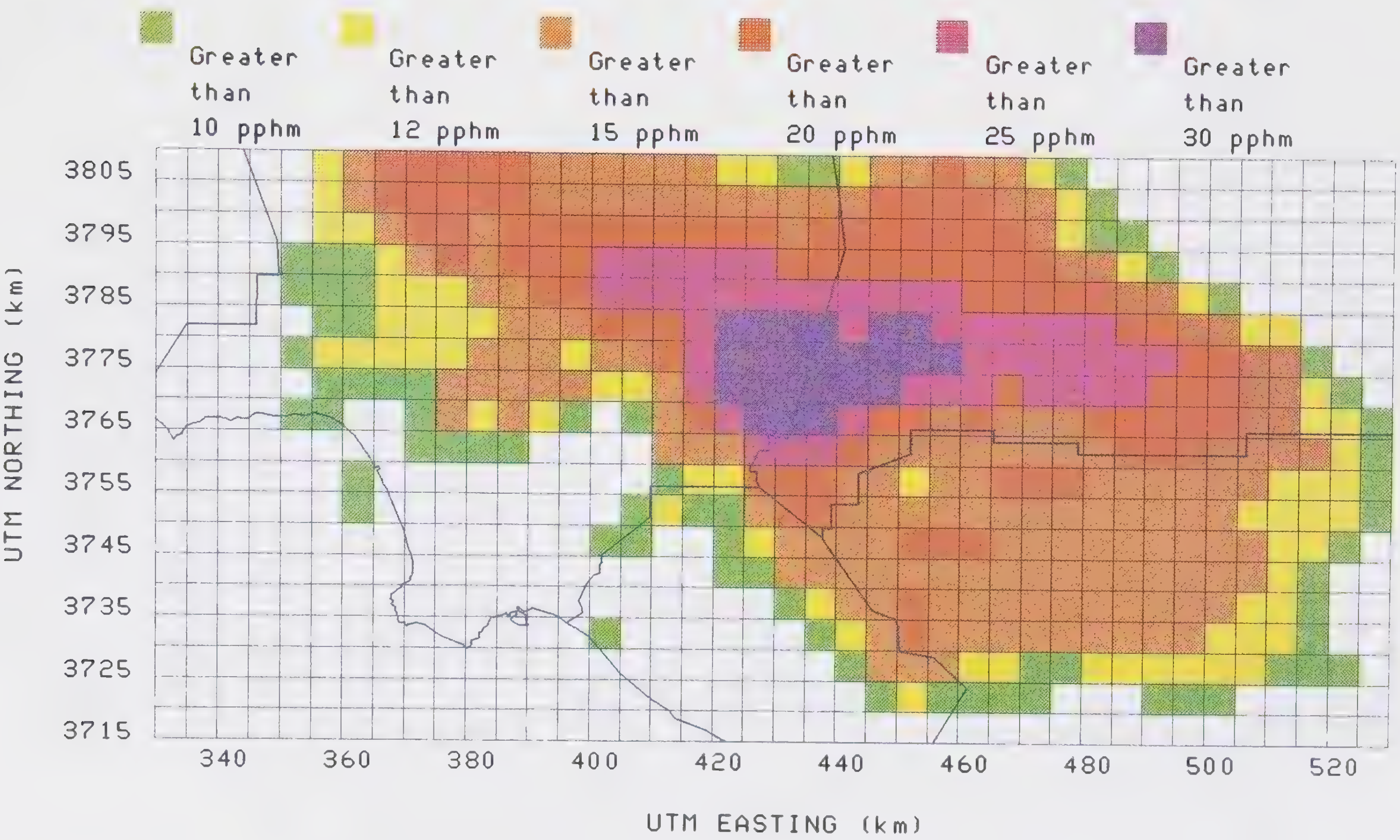


FIGURE 5-9

Model-Predicted Maximum Hourly Ozone Concentrations
in the South Coast Air Basin in 1985

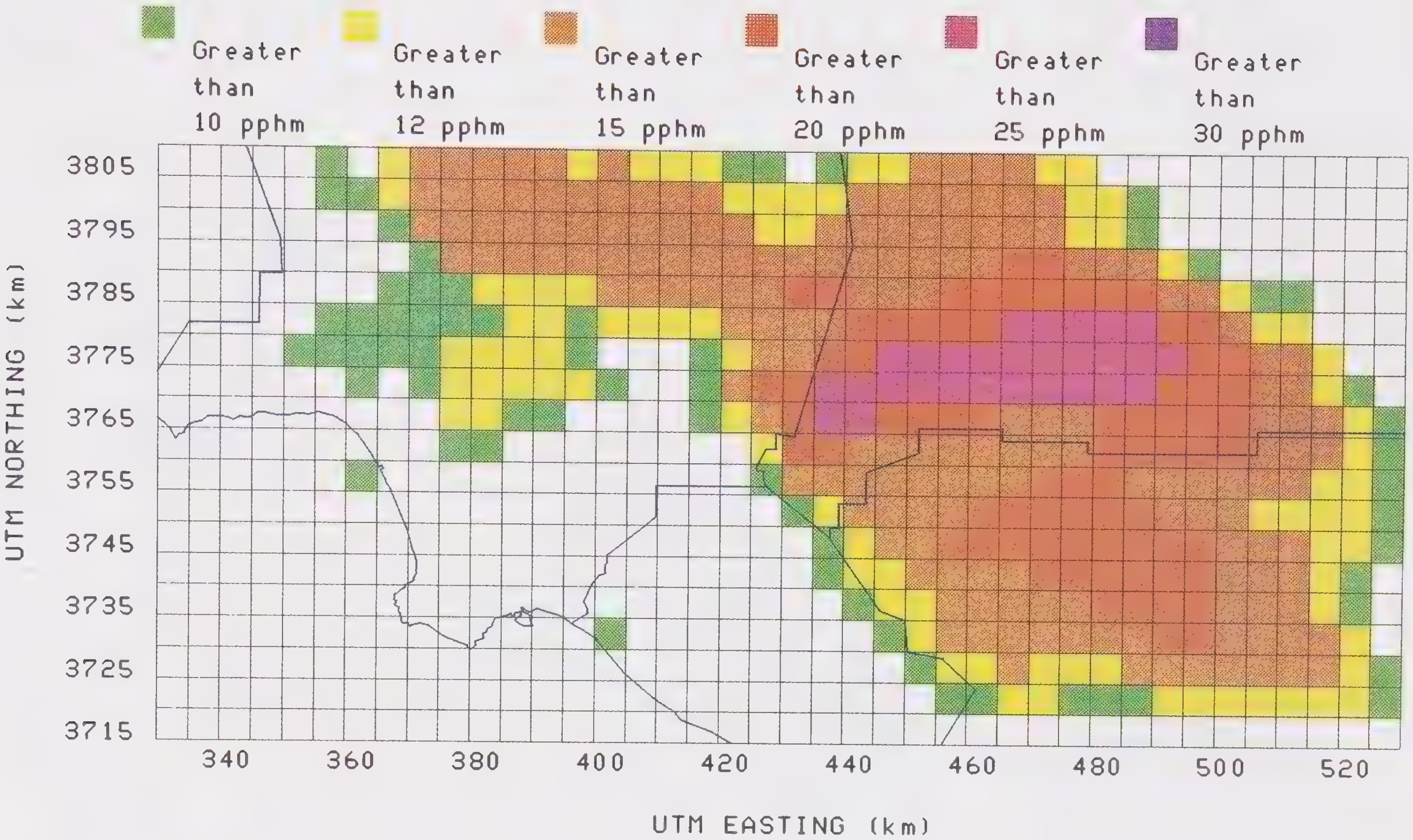


FIGURE 5-10

Model-Predicted Maximum Hourly Ozone Concentrations in the South Coast Air Basin in 2010

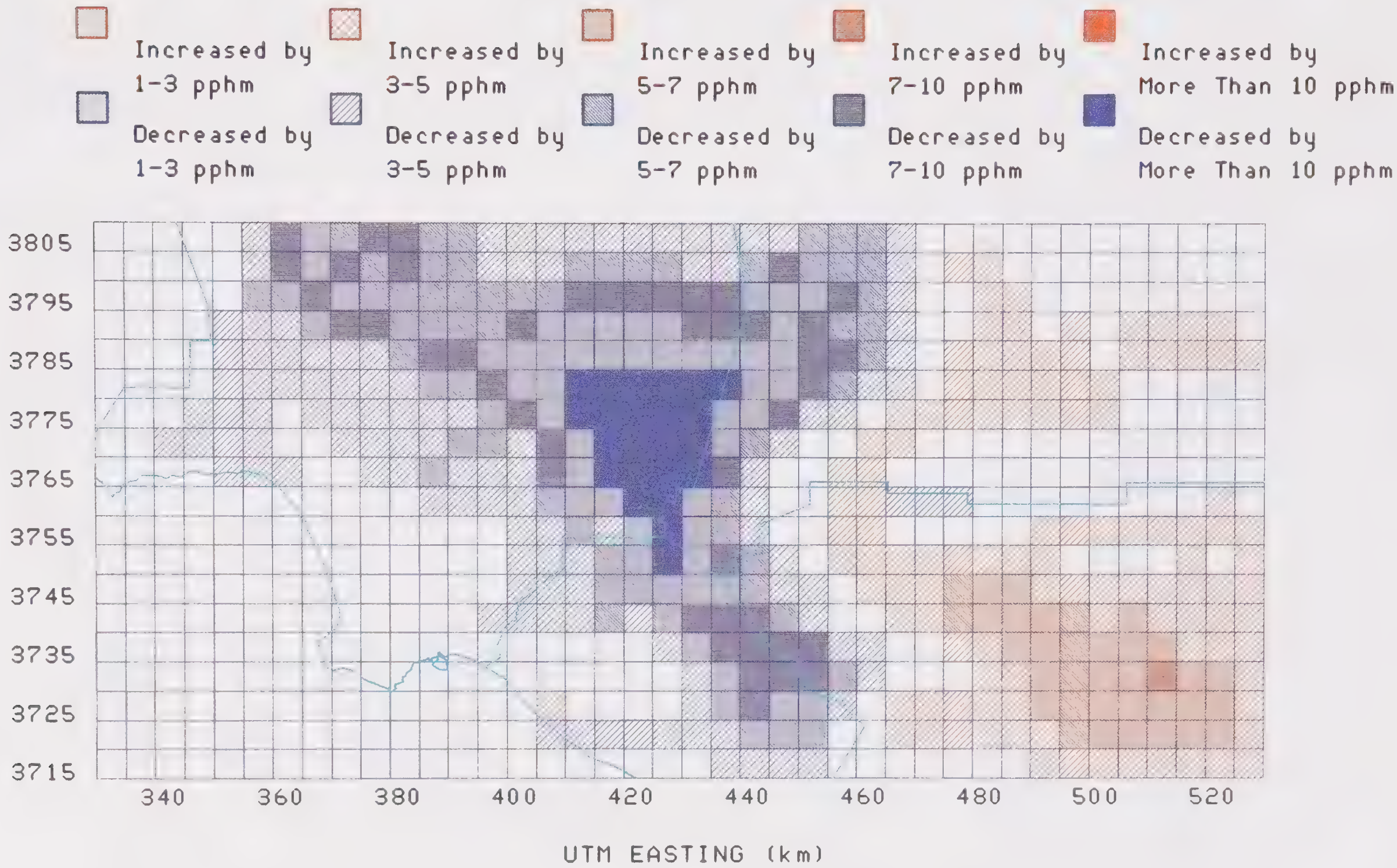


FIGURE 5-11

Model-Predicted Changes in Maximum Hourly Ozone Concentrations
in the South Coast Air Basin From 1985 To 2010

TABLE 5-1

Basinwide Precursor Emissions and Model-Predicted Ozone Concentrations And Exposure For Different Control Scenarios

Scenario	Episode-Specific Emissions (tons/day)* ROG	Episode-Specific Emissions (tons/day)* NOx	Peak Ozone Concentration (pphm)	Basinwide Average Per - Capita Exposure (pphm - hour) > 12 pphm	Basinwide Average Per - Capita Exposure (pphm - hour) > 20 pphm
1985 Baseline	1423	1063	36.0	13.8	3.45
2000 Baseline	1138	948	29.1	8.8	1.53
2010 Baseline	1221	1056	29.8	11.8	2.21
2010 with Tier I Control	627	470	20.4	3.6	0.01
2010 with Tier II Control	401	312	16.6	1.3	0.00
2010 with Tier III Control	200	195	12.6	0.0	0.00

* These emissions data are for the June 5-7, 1985 episode and are not the same as those for an annuual average day as shown in Chapters 3 and 4.

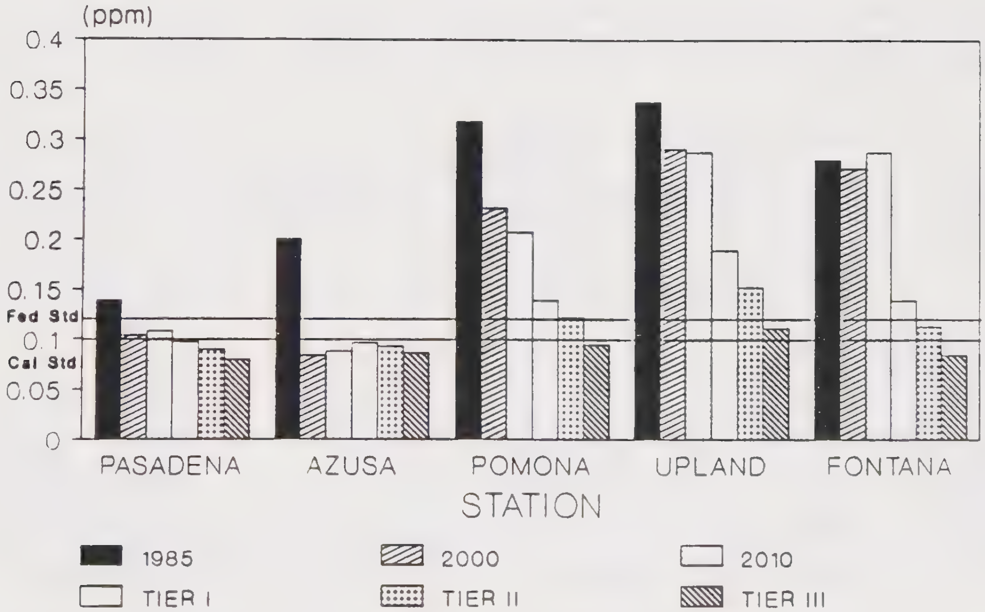


FIGURE 5-12

Maximum Hourly Ozone Concentration Projections in the South Coast Air Basin

concentrations, and basinwide average per-capita exposure estimates (pphm-hour above threshold). These emission estimates are specific to the episode modeled (June 5-7, 1985) and therefore differ from the annual average daily emissions reported in Chapter 3. UAM simulations were conducted to determine the effectiveness of various major control options, including methanol conversion, electrification, and solvent substitution. The results indicate that the Tier I control option would be required to reduce the basinwide peak ozone concentrations down to the Stage I Episode level (0.20 ppm). However, no individual control option by itself can bring the entire Basin into compliance with the ozone standard. A combination of all control options (Tier III) will be required to reduce the basinwide peak ozone concentrations to the level of the federal standard. However, it should be noted that the impacts of biogenic and geogenic ROG emissions are not considered here because of the great uncertainty associated with their photochemical reactivities. Further study will be conducted by the District to better define the photochemical reactivity and ozone impact of these ROG emissions. Appendix V-S summarizes all the UAM runs conducted in determining compliance.

Carbon Monoxide

A modified rollback modeling approach based on gridded emissions data was used to evaluate future CO air quality (see Appendix V-T for details). Figure 5-13 displays the model-predicted peak 8-hour average concentrations under 1985, 2000, and 2010 baseline emissions, and for 2010 under Tier I, Tier II, and Tier III control scenarios at the five stations with the highest CO concentrations.

No other monitoring stations were projected to exceed the CO standard in either 2000 and 2010, with or without further control. The 8-hour average standard is more stringent than the 1-hour standard at all monitoring stations. Table 5-2 displays the number of basinwide station exceedances of both the 8-hour and 1-hour standards and the maximum concentrations.

The results of this modified rollback modeling indicate that: (1) the entire Basin would be in full compliance with the federal and state 1-hour average CO standard in the year 2000 and 2010 without new control requirements,

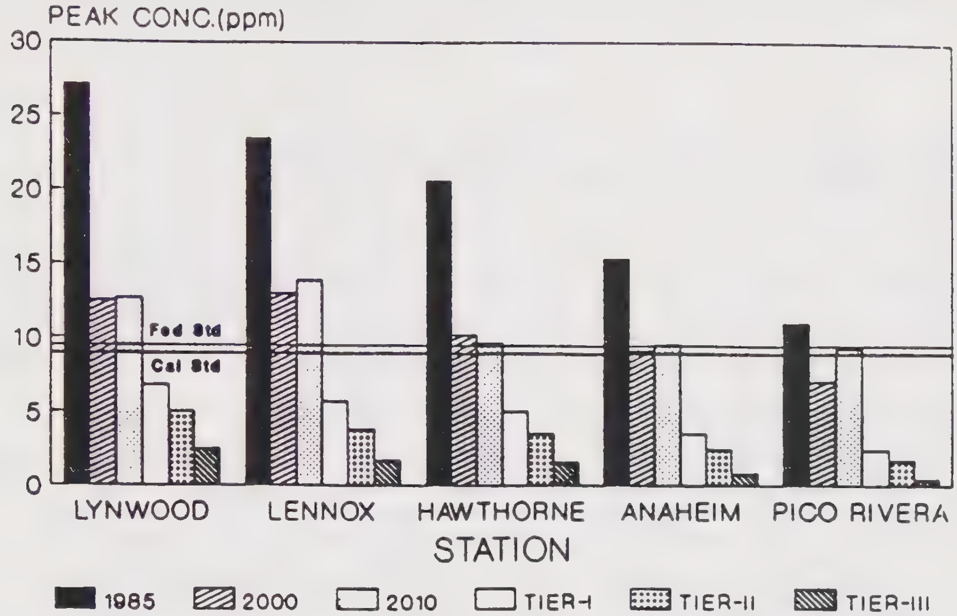


FIGURE 5-13

Maximum 8-Hour Average Carbon Monoxide Concentration Projections in the South Coast Air Basin

TABLE 5-2

Projections of Carbon Monoxide Air Quality in the South Coast Air Basin

	No. of Station Exceedances*		Max. Conc. (ppm)	
Scenario	1-Hour	8-Hour	1-Hour	8-Hour
1985 Baseline	88	233	33.0	27.1
2000 Baseline	0	16	16.9	13.0
2010 Baseline	0	67	21.7	13.9
2010 with Tier I Control	0	0	8.6	6.8
2010 with Tier II Control	0	0	6.4	5.0
2010 with Tier III Control	0	0	3.2	2.5

*Relative to the state standard

but (2) Tier I control would be required to bring the entire Basin into compliance with the fedaral and state 8-hour standard.

AIR QUALITY IMPACTS OF PLAN IN YEAR 2000

In addition to evaluating the level of control needed to attain the standards, modeling analyses were also performed to estimate the air quality impacts of the controls in the year of 2000. This assessment was based on maximum implementation of all Tier I and Tier II control measures.

It is estimated that this level of control in 2000 will have the following air quality impacts: (1) compliance with all federal and state standards for carbon monoxide, (2) compliance with all federal and state standards for nitrogen dioxide, (3) compliance with the federal annual and 24-hour average PM10 standards basinwide but with very little safety margin, (4) basinwide peak 24-hour average PM10 concentrations of about 2.4 times the state standard and annual average PM10 concentration about 1.5 times the state standard, (5) complete elimination of Stage I Episodes (0.20 ppm) for ozone in this Basin, and (6) basinwide average per-capita ozone exposure above the federal standard lowered by about 90 percent from the 1985 level.

BASIN EMISSION CARRYING CAPACITY

The South Coast Air Quality Management District is required to separately identify the emission reductions and corresponding type and degree of implementation measures required to meet federal and state ambient air quality standards. Section 40463(b) of the California State Health and Safety Code specifies that, with the active participation of the Southern California Association Governments, a South Coast Air Basin emission carrying capacity for each state and federal ambient air quality standard shall be established by the South Coast District Board for each formal review of the Plan and shall be updated to reflect new data and modeling results.

A carrying capacity is defined as the maximum level of emissions which enable the attainment and maintenance of an ambient air quality standard for a pollutant. Emission carrying capacity for state standards shall not be a part of

the State Implementation Plan requirements of the Clean Air Act for the South Coast Air Basin.

Emission carrying capacity as defined in the Health and Safety Code is an overly simplistic measure of the basinwide allowable emission levels for specific ambient air quality standards. It is highly dependent on the spatial and temporal pattern of the emissions. Because of the multicomponent nature of PM10, carrying capacity for the contributing emittants can vary significantly. For ozone and secondary PMl0 components, the carrying capacity is a non-linear function among their precursors.

Based on the modeling results for the 1988 AQMP Revision, a set of carrying capacities can be defined corresponding to federal and state ambient air quality standards for CO, NO2, PM10, and O3 (see Table 1). These estimates are based on emission patterns estimated for the year of 2010. The modeling results indicate that all the Tier II control measures will be required to barely meet the federal 24-hour standard for PM10, and all the Tier III control measures will be needed to meet the federal ozone standard. There were no estimations made for the carrying capacity for the state PM10 and ozone standards for the 1988 AQMP Revisions. The District will continuously further define and refine the carrying capacity estimation by undertaking additional model simulations for a number of representative episodes.

TABLE 5-3
EMISSION CARRYING CAPACITY ESTIMATION UPDATE FOR THE 1988 AQMP REVISION FOR THE SOUTH COAST AIR BASIN

		Carrying Capacity Estimate (tons/day)				
Pollutant	Standard	ROG	NOx	CO	SOx	PM
CO	Federal 1-hour			7900		
	Federal 8-hour			3300		
	State 1-hour			4500		
	State 8-hour			4200		
NO_2	Federal Annual		920			
	State 1-hour		620			
PM_{10}	Federal 24-hour		364		47	1370
	Federal Annual		540		47	1370
O_3	Federal 1-hour	200				
OVERALL BASINWIDE		**200**	**364**	**3200**	**47**	**1370**

CHAPTER 6

IMPLEMENTATION

Introduction

Tier I Implementation

Tier II Implementation

Tier III Implementation

Contingency Plan Development

INTRODUCTION

The AQMP control strategies presented in this document were selected to meet the goal of attaining all air quality standards by the year 2007, as directed by the South Coast Air Quality Management Board in January, 1988. It is an ambitious program, one that requires tough controls, extensive research and development, and strong public support. This strategy has both short-term and long-term components. These components differ in both purpose and content, yet are compatible, and each is necessary if we are to achieve clean air within a generation.

The short-term, or Tier I, component of the AQMP is action-oriented. It identifies specific control measures for which control technology exists now. For the most part, these measures can be adopted within the next five years, prior to the next AQMP update. They consist mainly of stationary source controls that will be the subject of District rules, ARB-adopted tailpipe emissions standards and performance requirements for motor vehicles, *and federally-adopted programs to reduce emissions from sources under federal government jurisdiction, which contribute approximately to fifteen (15) percent of ozone producing precursors. EPA will take the lead to coordinate all necessary federal efforts. The schdule for rule adoption places emphasis on those measures designed to achieve the highest levels of emission reductions after considering other appropriate factors (e.g., cost effectiveness, public acceptance).*

Transportation and land use controls and energy conservation measures are also included in Tier I of the Plan, to the extent that technology is available to accomplish the emissions reduction targets. However, these measures have been divided further into those already identified for funding within the next five years and those for which funding must be sought. Only the funded transportation facility construction programs show associated emission reductions by 1993.

The long-term component described by Tiers II and III is aimed at full attainment of all standards- clean air for all residents of the basin year-round. To achieve the reductions needed for attainment, given expected growth and development, it is necessary to transcend the boundaries of known technology.

In contrast to the specific measures and implementation schedule laid out in Tier I, Tiers II and III are more akin to a long-term work plan. The measures included in these tiers identify actions which must be taken to ensure that the needed technological advances will occur.

While all the population growth and emission projections may not occur precisely as forecast, it is certain that significant technological changes will occur over the next twenty years. These changes, as well as air pollution control, will profoundly affect the way Southern Californians live and work. A look back twenty years provides some insight into the extent of technological change that may occur in the future.

In 1968, the use of slide rules was common in schools and laboratories. Computers were large and slow. They were very sensitive to temperature variations and required constant feeding with punch cards which had to be laboriously prepared. Calculators were expensive and rare.

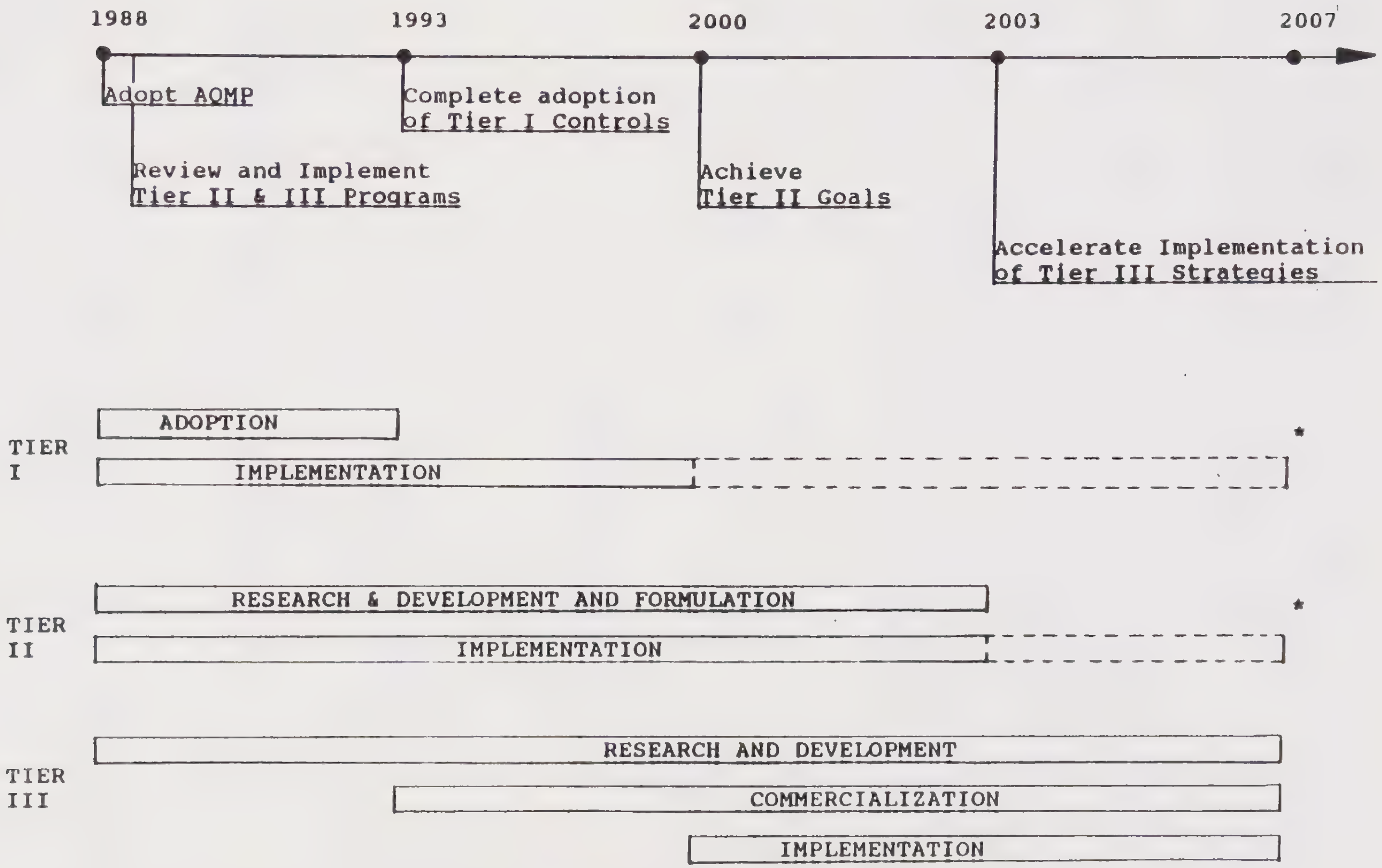
Today's personal computer at home or work can outperform the huge mainframe of twenty years ago. The microchips that made this possible have transformed office, home, and automobile. Automation that would have seemed almost like science fiction in the sixties is now taken for granted.

This automation will continue to advance because the rate of technological development has been accelerating. Recent advances in superconductivity and fuel cell technologies point the way to the future by providing non-polluting energy sources for both industry and transportation. These and other technological advancements hold great promise for improving air quality in concert with other benefits.

The purpose of this chapter is to identify the type of changes that will be required to carry out the proposed AQMP strategies, and to set forth the actions, research, and legislation needed to guide these changes. The key elements to the success of this Plan include the public's understanding of the effort needed to achieve clean air in Southern California and immediate support from state and local government, business, and the public to begin work now on the long-term difficult tasks which are needed. Long-term change cannot come about without long-term commitment by the state and the Southern California community. That commitment, in turn, can only evolve from broad understanding and support. Figure 6-1 shows the overall implementation timetable.

FIGURE 6-1

Attainment Strategy Timetable



* Activities related to transportation facility construction will continue until 2007.

TIER I IMPLEMENTATION

All of the control measures included in Tier I can be adopted over the next five years with full implementation by the year 2000, except for measures related to transportation facility construction which will continue until the year 2007. Tier I measures can be implemented using today's technology and management programs. Implementation would be without regard for type of pollutant because all Tier I measures are required to meet air quality standards. It should be noted that significant institutional commitments and changes will likely be needed to achieve many of the measures particularly those that affect transportation systems and land use. Figure 6-2 presents the overall Tier I implementation schedule and activities. Tier I control measures can be implemented by existing agencies, in most cases with existing authority. Additional authority and resources will be needed to develop and implement system-wide measures to reduce emissions from transportation sources (non-tail pipe measures). Among Tier I control measures, the District Board approved a number of Early Action Plan measures which are listed in Table 6-1. Early Action Measures are scheduled for adoption by the end of 1989. The remaining Tier I control measures are ranked in priority order for implementation according to the following criteria:

Emission reduction potential;

Length of time required to implement;

Technical, institutional, and legal readiness;

Cost effectiveness of control;

Availability of financing;

Short term benefit without interfering with long term goals;

Number of years benefit would accrue.

Based on this ranking, the activities required to adopt the Tier I control measures are scheduled over the next five years. District-implemented measures are listed in chronological order in Table 6-2. Those control measures which need to be implemented by local governments are shown in Table 6-3. Measures which require implementation by one or more

transportation control agencies are listed in Table 6-4. Control measures to be implemented by the Air Resources Board, such as lowering pollutant emissions standards for vehicles, are given in Table 6-5. Those measures needing to be implemented by other state agencies or by federal agencies are presented in Table 6-6. Each of the control measures in Tables 6-2 to 6-6 has been assigned a priority ranking as noted previously, and is listed by control number within each year without further prioritization.

An annual work plan to implement selected Tier I control measures for the following calendar year will be prepared and submitted to the District Board and SCAG for approval. While preparing the annual work plan, the remaining measures subject to implementation will be reprioritized based on any additional information available to the District and SCAG. An annual auditing report will be prepared by the District and SCAG to monitor implementation progress. Recommendations regarding stringency or the need for additional measures will be made as necessary.

FIGURE 6-2

Tier I Implementation Schedule And Activities

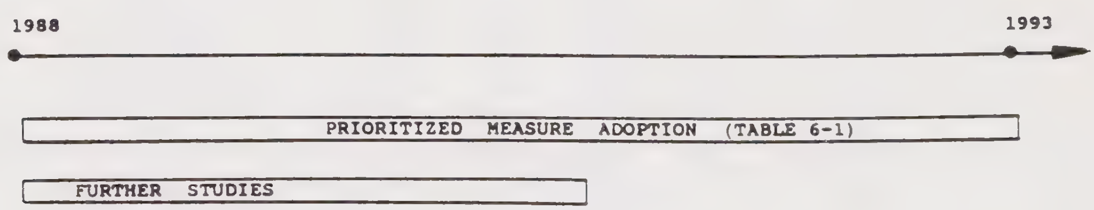


TABLE 6-1
Early Action Measures Implemented By
The District By Rule Adoption

Control Measure Number	Title	Date	AQMP Appendix No., Page No.	AQMP Addendum No., Page No.
A-11	Substitute Solvents Used for Clean-up of Surface Coating [ROG]	1989	IV-A, pp. A37-A39	--------
A-12	Further Emission Reductions from Metal Cleaning and Degreasing [ROG]	1989	IV-A, pp. A40-A45	--------
A-21	Further Control of Emissions from Adhesives [ROG]	1989	IV-A, pp. A71-A73	IV-A, p. 10
B-13	Further Emission Reductions from Valves, Pumps,Compressors Used in Oil and Gas Production Fields, Refineries and Chemical Plants [ROG]	1989	IV-A, pp. B43-B48	IV-A, pp. 11-12; IV-A Modification, p. M3
C-9	Control of Emissions from Stationary Gas Turbines [NOx]	1989	IV-A, PP. C32-C34	IV-A, p. 14; IV-A Modification, p. M4
C-10	Control of Emissions from Electric Power Generation Boilers [NOx]	1989	IV-A, pp. C35-C37	IV-A, p. 15
F-8	New Source Review [All Pollutants]	1989	IV-A, pp. F25-F27	IV-A, pp. 24-26; IV-A Modification, P. M11
G-4	Clean Fuels in New Fleet Vehicles [All Pollutants]	1989	IV-A, pp. G14-G20	--------
I-1	Control of Emissions from Ship Berthing Facilities [NOx]	1989	IV-A, pp. I3-I5	--------

TABLE 6-2
Control Measures Implemented By
The District By Rule Adoption
(1 of 5)

Control Measure Number	Title	Date	AQMP Appendix No., Page No.	AQMP Addendum No., Page No.
A-3	Further Emission Reductions from Can and Coil Coating [ROG]	1989	IV-A, pp. A10-A12	--------
A-4	Further Emission Reductions from Aerospace Assembly and Component Coating [ROG]	1989	IV-A, pp. A13-A15	IV-A, p. 4
A-5	Further Emission Reduction from Automobile Assembly Coating [ROG]	1989	IV-A, pp. A16-A18	--------
A-10	Further Emission Reductions from Graphic Art Operation [ROG]	1989	IV-A, pp. A34-A36	--------
A-14	Control of Emissions from Expanding Plastics and Blowing Foam Manufacturing Operation [ROG]	1989	IV-A, pp. A48-A50	IV-A, p. 8
G-2	Clean Fuel Retrofit of Transit Buses [ROG]	1989	IV-A, pp. G6-G8	--------
1.a(1)	Alternative Work Weeks and Flextime [ROG, NOx, CO]	1989	IV-G, pp. 54-60	--------
2.c	Vanpool Vehicle Purchase Incentives [ROG, NOx, CO]	1989	IV-G, pp. 88-93	--------
8	Airport Ground Access [ROG, NOx, CO]	1989	IV-G, pp. 161-168	--------
12.a(2)	Paved Roads [PM]	1989	IV-G, pp. 186-190	IV-G Modification, M23

(1) Also implemented by the local governments. See Table 6-3.
(2) Paved Roads implemented by the District and the local governments. See Table 6-3.

TABLE 6-2
Control Measures Implemented By
The District By Rule Adoption
(2 of 5)

Control Measure Number	Title	Date	AQMP Appendix No., Page No.	AQMP Addendum No., Page No.
A-8a	Further Emission Control on Architectural Coatings [ROG]	1990	--------	IV-A, pp. 6-7
A-8b	Emission Charges on Architectural Coatings [ROG]	1990	IV-A, pp. A27-A30	IV-A, p. 6
A-13	Control of Emissions from Rigid and Flexible Disc Manufacturing Operation [ROG]	1990	IV-A, pp. A46-A47	--------
B-14	Control of Emissions from Oil Field Steam Generators [NOx]	1990	IV-A, PP. B49-B51	--------
B-2	Control of Emissions from Gasoline Transfer: Improved Installation and Repair of Phase-II Vapor Recovery Systems [ROG]	1990	IV-A, pp. B8-B10	IV-A, p. 10
C-2	Control Of Emissions from Internal Combustion Engines [All Pollutants]	1990	IV-A, pp. C41-C43	IV-A, pp.15-16; IV-A Modification, p. M3
F-2	Uniform Commercial Quality Standard on Sulfur Content of Gaseous Fuels [SOx]	1990	IV-A, pp. F6-F10	--------
F-5	Control of Ammonia Emissions from Stationary Sources by Permits and Fees [Ammonia]	1990	IV-A, pp. F18-F19	--------
F-10	Phase-Out Stationary Source Fuel Oil and Solid Fossil Fuel Use [NOx, PM, SOx]	1990	IV-A, pp. F31-F34	IV-A, p. 27; IV-A Modification, p. M12
F-11	Emission Minimization Management Plan [All Pollutants]	1990	-------	IV-A Modification, pp. M13-M14
G-1	Urban Bus System Electrification [All Pollutants]	1990	IV-A, pp. G3-G5	IV-A, pp. 27-28
G-3	Use of Radial Tires on Light Duty Motor Vehicles [PM]	1990	IV-A, pp. G9-G10	IV-A, p. 28
2.d[1]	Merchant Transportation Incentives [ROG, NOx, CO]	1990	IV-G, pp. 94-100	--------

[1] Also implemented by the local governments. See Table 6-3.

TABLE 6-2
Control Measures Implemented By
The District By Rule Adoption
(3 of 5)

Control Measure Number	Title	Date	AQMP Appendix No., Page No.	AQMP Addendum No., Page No.
3.a	Truck Dispatching, Rescheduling and Rerouting [ROG, NOx, CO]	1990	IV-G, pp. 120-126	--------
7	Centralized and Ground Power Systems [ROG,NOx]	1990	IV-G, pp. 156-160	--------
A-16[1]	Further Emission Reductions from Perchloroethylene Dry Cleaning Operation [ROG]	1991	IV-A, pp. A54-A57	IV-A Modification, p.M3
A-17	Further Emission Reductions from Petroleum Dry Cleaning Operation [ROG]	1991	IV-A, pp. A58-A60	IV-A, pp. 8-9
B-3	Control of Emissions from Open Sumps, Pits, and Wastewater Separators [ROG]	1991	IV-A, pp. B11-B13	IV-A, pp. 10-11
B-7	Control of Emissions from Petroleum Refinery Fluid Catalytic Cracking (FCC) Units [SOx]	1991	IV-A, pp. B24-B26	--------
B-8	Control of Emissions from Petroleum Coke Calcining Operations [SOx]	1991	IV-A, pp. B27-B28	--------
B-10	Improved Control of Emissions from Petroleum Refinery Fluid Catalytic Cracking (FCC) Units [PM]	1991	IV-A, pp. B32-B34	--------
C-3	Control of Emissions from Commercial Charbroiling [ROG, PM]	1991	IV-A, pp. C11-C14	--------
C-4	Further Emission Reductions from Rubber Products Manufacturing [ROG, PM]	1991	IV-A, pp. C15-C17	--------
C-6	Control of Emissions from Woodworking Operations [PM]	1991	IV-A, pp. C21-C25	--------
2.a[2]	Employer Rideshare and Transit Incentives [ROG, NOx, CO]	1991	IV-G, pp. 74-80	--------

(1) This is contingent upon EPA determination regarding the photochemical reactivity and toxicity of perchloroethylene.
(2) Also implemented by the local governments. See Table 6-3.

TABLE 6-2
Control Measures Implemented By
The District By Rule Adoption

Control Measure Number	Title	Date	AQMP Appendix No., Page No.	AQMP Addendum No., Page No.
B-4	Control of Emissions from Pleasure Boat Fueling Operations [ROG]	1992	IV-A, pp. B14-B16	--------
B-9	Control of Emissions from Gas Fired Petroleum Refinery Process Heaters [PM]	1992	IV-A, pp. B29-B31	--------
C-7	Control of Emissions from Small Boilers and Process Heaters [NOx]	1992	IV-A, pp. C26-C28	--------
D-1	Control of Emissions from Starter Fluid [ROG]	1992	IV-A, pp. D3-D5	IV-A, p. 16
D-3	Control of Fugitive Emissions from Publicly Owned Treatment Works [ROG]	1992	IV-A, pp. D18-D20	IV-A, p. 21; IV-A Modification, p. M5
F-1	Installation of Best Available Retrofit Control Technology [All Pollutants]	1992	IV-A, pp. F3-F5	IV-A, pp. 22-23
F-3	Lower Limits on Sulfur Content of Stationary Liquid Fuels [SOx]	1992	IV-A, pp. F11-F14	--------
I-4	Control of Emissions from Marine Diesel Operations [NOx]	1992	IV-A, pp. I17-I20	IV-A, p. 45
I-5	Limit on Sulfur Content of Marine Fuel Oils [SOx]	1992	IV-A, pp. I21-I25	--------
I-7	Control of Emissions from Utility Equipment [All Pollutants]	1992	IV-A, pp. D21-D25	IV-A, pp. 21-22 IV-A Modification, p. M15
6	Aircraft and Ground Service Vehicles [ROG, NOx, CO]	1992	IV-G, pp. 149-155	--------
A-1	Further Emission Reductions from Wood Flatstock Coating [ROG]	1993	IV-A, pp. A4-A5	--------
A-9	Further Emission Reductions from Paper, Fabric and Film Coating [ROG]	1993	IV-A, pp. A31-A33	--------

TABLE 6-2
Control Measures Implemented By
The District By Rule Adoption
(5 of 5)

Control Measure Number	Title	Date	AQMP Appendix No., Page No.	AQMP Addendum No., Page No.
A-20	Control of Emissions from Solvent Waste [ROG]	1993	IV-A, pp. A67-A70	--------
B-1	Control of Emissions from Gasoline Transfer: Fail-Safe Phase-1 Vapor Recovery Systems [ROG]	1993	IV-A, pp. B4-B7	--------
B-5	Control of Emissions from Cyclic Steam Production Wells [ROG]	1993	IV-A, pp. B17-B20	--------
B-6	Control of Emissions from Crude Oil Pipeline Heaters [NOx]	1993	IV-A, pp. B21-B23	--------
B-12	Control of Emissions from Petroleum Refinery Flares [All Pollutants]	1993	IV-A, pp. B39-B42	IV-A, p. 11
C-1	Control of Emissions from Large Commercial Bakeries [ROG]	1993	IV-A, pp. C3-C6	--------
C-5	Control of Emissions from Afterburners [NOx]	1993	IV-A, pp. C38-C40	IV-A, p. 15
E-2	Control of Emissions from Livestock Waste [ROG, PM, Ammonia]	1993	IV-A, pp. E7-E13	IV-A Modification, p. M11
H-1	Banning of New Drive-Through Facilities [ROG, NOx, CO]	1993	IV-A, pp. H3-H4	IV-A, p. 37; IV-A Modification, p. M15
10	General Aviation Vapor Recovery [ROG]	1993	IV-G, pp. 175-179	--------

TABLE 6-3
Control Measures Implemented By
Local Governments
(1 of 2)

Control Measure Number	Title	Activities	Date	AQMP Appendix No., Page No.
1.a	Alternative Work Weeks and Flextime [ROG, NOx, CO]	Ordinance Adoption	1990	IV-G, pp. 54-60
2.a	Employer Rideshare and Transit Incentives [ROG, NOx, CO]	Ordinance Adoption	1990	IV-G, pp. 74-80
2.e	Auto use Restrictions [ROG, NOx, CO]	Ordinance Adoption	1990	IV-G, pp. 101-107
17	Growth Management [ROG, NOx, CO]	Ordinance Adoption	1990	IV-G, pp. 224-231
18.a	Local Government Energy Conservation Program [All Pollutants]	Ordinance Adoption	1990	IV-G, pp. 232-238 IV-G Modification, p. M24
18.b	Waste Recycling [All Pollutants]	Ordinance Adoption	1990	IV-G, pp. 239-246 IV-G Modification, pp. M24-M25
18.c	Energy Pricing, Tax, and Subsidy Incentives [All Pollutants]	Ordinance Adoption	1990	IV-G, pp. 247-254 IV-G Modification, p. M25
D-4	Emissions Reductions from Swimming Pool Water Heating [NOx]	Ordinance Adoption	1990	IV-A Modification, pp. M5a-M6
D-5	Control of Emissions from Residential and Commercial Water Heating [NOx]	Ordinance Adoption	1990	IV-A Modification, pp. M7-M10
**	Adoption Of AQMP By Ventura County [All Pollutants]	Plan Revision	1990	---------
1.b	Telecommunications [ROG, NOx, CO]	Ordinance Adoption	1991	IV-G, pp. 61-73

** No Control Measure Number Assigned.

TABLE 6-3
Control Measures Implemented By
Local Governments
(2 of 2)

Control Measure Number	Title	Activities	Date	AQMP Appendix No., Page No.	AQMP Addendum No., Page No.
F-4	Control Of Fugitive Emissions From Construction Of Roads And Buildings [PM]	Ordinance Adoption	1991	IV-A, pp. F15-F17	IV-A Modification, p.M11
F-9	Low Emission Materials For Building Construction	Ordinance Adoption	1991	IV-A, pp. F28-F30	---------
2.b	Parking Management [ROG, NOx, CO]	Ordinance Adoption	1992	IV-G, pp. 81-87	---------
D-2	Out-Of-Basin Transportation of Biodegradable Solid Waste [All Pollutants]	Ordinance Adoption	1992	IV-A, pp. D14-D17	IV-A, pp. 17-20; IV-A Modification, p M5
E-3	Control Of Fugitive Dust From Agriculture [PM]	Ordinance Adoption	1993	IV-A, pp. E14-E16	---------
12.a	Paved Roads [PM]	Encourage Ordinance Adoption	N/A	IV-G, pp. 186-190	IV-G Modification, p. M23
12.b	Unpaved Roads and Parking Lots [PM]	Encourage Ordinance Adoption	N/A	IV-G, pp. 191-196	IV-G Modification, p. M23

N/A: Not Applicable.

TABLE 6-4
Control Measures Implemented By
Transportation Agencies

Control Measure Number	Title	Agencies	Activities	Date	AQMP Appendix No., Page No.	AQMP Addendum No., Page No.
3.b	Diverting Port-Related Truck Traffic To Rail [ROG, NOx, CO]	Ports of LA & LB/ Caltrans/ PUC	Adopt Standards	1989	IV-G, pp. 127-132	---------
4	Traffic Flow Improvements [ROG, NOx, CO]	Caltrans/ CTC	Construction	1989	IV-G, pp. 133-137	---------
5	Nonrecurrent Congestion Relief [ROG, NOx, CO]	Caltrans/ CTC/CHP	Policy Development	1989	IV-G, pp. 138-148	---------
11	Rail Consolidation To Reduce Grade Crossings [ROG, NOx, CO]	Ports of LA & LB/ Caltrans/ PUC	Adopt Standards	1989	IV-G, pp. 180-185	---------
2.f	HOV Facilities [ROG, NOx, CO]	Caltrans	Secure Funding	1992	IV-G, pp. 108-113	---------
2.g	Transit Improvements [ROG, NOx, CO]	Caltrans/ UMTA/CTC	Secure Funding	1992	IV-G, pp. 114-119	---------
13	Freeway and Highway Capacity Enhancements [ROG, NOx, CO]	Caltrans/ CTC	Construction	1992	IV-G, pp. 197-201	IV-G Modification, p. M25
16	High Speed Rail [ROG, NOx]	Caltrans	Secure Funding/ Construction	1993	IV-G, pp. 219-223	---------

TABLE 6-5
Control Measures Implemented By
ARB By Rule Adoption
(1 of 2)

Title	Date Of Rule Adoption	Date Of Implementation	AQMP Appendix No., Page No.
Add Heavy Duty Gasoline Vehicles to Inspection and Maintenance Program [ROG, NOx, CO]	1983	1989	IV-F, p. 10
New Methanol-Fueled Buses [NOx, SOx, PM]	1986	1991	IV-F, p. 8
Establish New Diesel Fuel Quality Standard [ROG, PM]	1988	1992	IV-F, p. 17
Heavy Duty Vehicle Smoke Enforcement Program [ROG, NOx, PM](1)	1989	1990	IV-F, p. 13
Further Evaporative Control/Larger Canisters For All Gasoline Vehicles [ROG]	1989	1991	IV-F, p. 15
Lower ROG and CO Standard For Gasoline Light Duty Vehicle [ROG, CO]	1989	1992	IV-F, pp. 15-16
Lower PM Emission Standard For Medium Duty and Light Heavy Duty Diesel Trucks [PM]	1989	1992	IV-F, pp. 16-17
Lower ROG, CO and NOx Emission Standards For Medium Duty and Light Heavy Duty Trucks [ROG, NOx, CO]	1989	1992	IV-F, p. 16
Improved Inspection and Maintenance and Elimination of Excess Emissions for Automobiles and Light and Medium Duty Trucks [ROG, NOx, CO](1)	1989	1995/1996	IV-F, pp. 10-11
Emission Standards For New Heavy Duty Construction Equipment [ROG, CO]	1990	1992	IV-F, pp. 20-21
Lower Gasoline Vapor Pressure Standard [ROG](1)	*	*	IV-F, p. 20

TABLE 6-5
Control Measures Implemented By
ARB By Rule Adoption
(2 of 2)

Title	Date Of Rule Adoption	Date Of Implementation	AQMP Appendix No., Page No.
Lower NOx Standard For Gasoline Light Duty Vehicles [NOx]	1993	1996	IV-F, p. 20
Lower NOx Standard For Heavy Duty Diesel Trucks [NOx]	1993	1997	IV-F, p. 20
Retrofit Particle Traps On Heavy Duty Diesel Buses [PM] (1), (2)	*	*	IV-F, p. 19
Emission Standards For Off-Road Motorcycles [ROG, CO] (2)	*	*	IV-F, p. 21
A-18 Control of Emissions from Underarm Products [ROG]	1992	*	IV-A, pp. A16-A63
A-19 Control of Emissions from Domestic Products [ROG]	1992	*	IV-A, pp. A64-A66
I-7 Utility Equipment	1992	*	IV-A, pp. D21-D25 IV-A Modification, p. M15
12.a Paved Roads	1990	*	IV-G, pp. 186-190 IV-G Modification, p. M23

(1) Based on passage of enabling legislation
(2) Further study required
* No dates set

TABLE 6-6
Control Measures Implemented By
State and Federal Agencies

Control Measure Number	Title	Date	Agency	AQMP Appendix No., Page No.	AQMP Addendum No., Page No.
I-2	Lower Emission Standards On New Jet Aircraft Engines [ROG, NOx]	1991	EPA/FAA	IV-A, pp. I6-19	--------
I-3	Control Of Fugitive Emissions From Marine Vessel Tanks [ROG]	1991	EPA/ARB	IV-A, pp. 110-116	--------
9	Replacement of High Emitting Aircraft [All Pollutants]	1992	EPA/FAA	IV-G, pp. 169-174	--------
B-11	Control Of Emissions From OCS Exploration,Development, And Production [All Pollutants]	1993	DOI	IV-A, pp. B35-B38	IV-A, p. 11
E-1	Control Of Emissions From Pesticide Application [ROG]	1993	EPA/CDFA	IV-A, pp. E3-E6	--------
I-6	Control on Switching Locomotives [All Pollutants]	1993	EPA/ARB/FRA	IV-A, pp. I30-I34	IV-A, p. 45
14	Railroad Electrification [All Pollutants]	1993	EPA/ARB/FRA	IV-G, pp. 202-208	--------

* No date set.
FAA = Federal Aviation Administration
CDFA = California Department of Food and Agriculture
FRA = Federal Railway Administration
DOI = Department of Interior

TIER II IMPLEMENTATION

The proposed Tier II control measures, as discussed in Chapter 4, are composed mostly of extensions or more stringent applications of Tier I control measures. Figure 6-3 illustrates the overall Tier II implementation schedule and activities. Immediate research and development activities are needed in the areas of solvent reformulation, *low emitting* vehicles, transportation infrastructure, *low emitting fuel combustion* technology, and *energy* supply and distribution systems. For example, the ongoing District Clean Fuels Program can facilitate the commercialization of *low emitting* vehicles. The agencies responsible for ensuring that research and development of Tier II measures occur during the specified period are listed in Table 6-7. Demonstration projects for Tier II measures are listed in Table 6-8.

Meanwhile, regulatory intervention such as technology-forcing standards or emission charges and growth management measures will also be developed to bring about the technological advancement necessary to achieve Tier II goals. Table 6-9 shows the agencies responsible for seeking this legislation.

To attain the reduction goals of Tier II by 2000, numerous agencies in addition to the District would need to agree to develop and follow demanding implementation schedules. These agencies may need to seek additional legal authority and resources to carry out these activities for which they would be responsible. They would also need to report their progress to other interested parties. The District will implement all measures related to stationary sources. Growth management measures may be implemented both by local governments and, potentially by regional organizations (e.g., District, SCAG). Local transportation commissions and Caltrans would need to propose and coordinate transportation infrastructure improvements. *At state and federal levels, ARB and EPA would need to establish more stringent emission standards for on-road and off-road vehicles and to participate actively in technology advancement of low emitting vehicles.*

FIGURE 6-3A

Stationary Sources:

Tier II Implementation Schedule And Activities

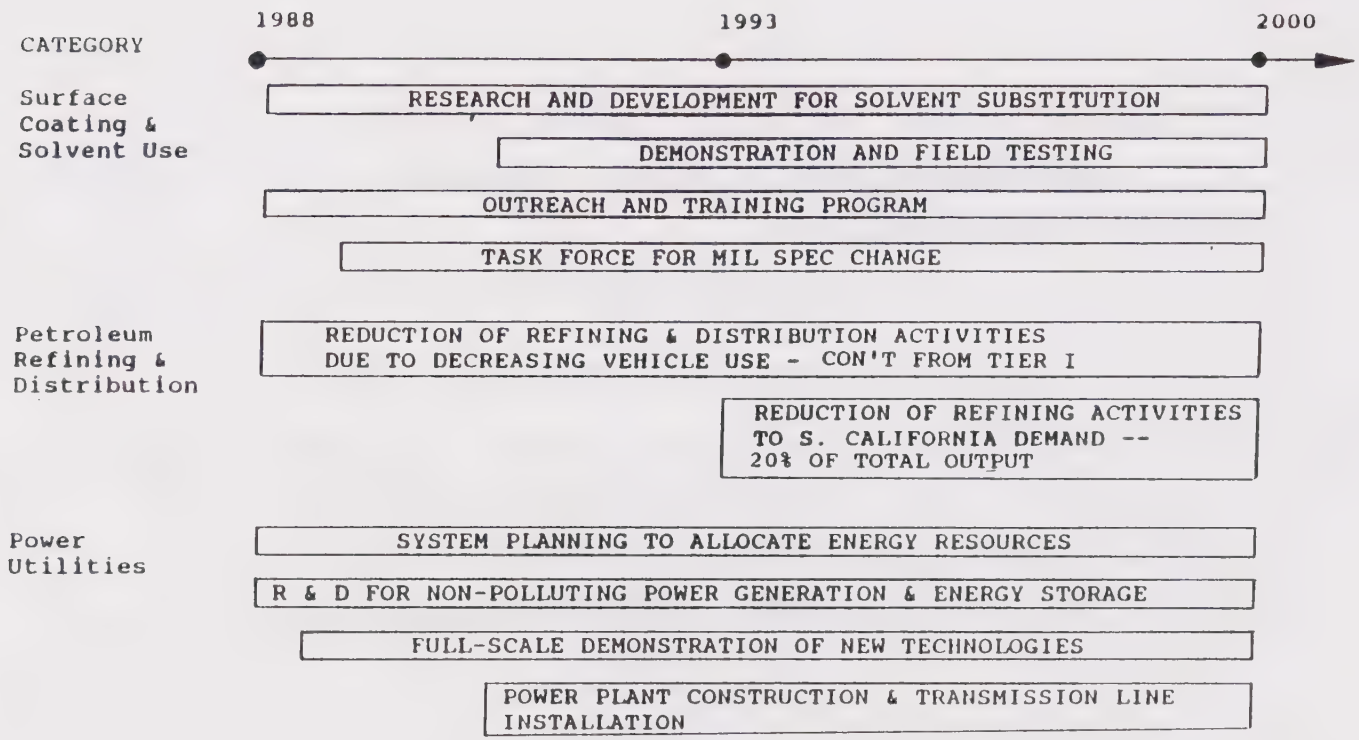


FIGURE 6-3A

Stationary Sources:

Tier II Implementation Schedule And Activities (Cont.)

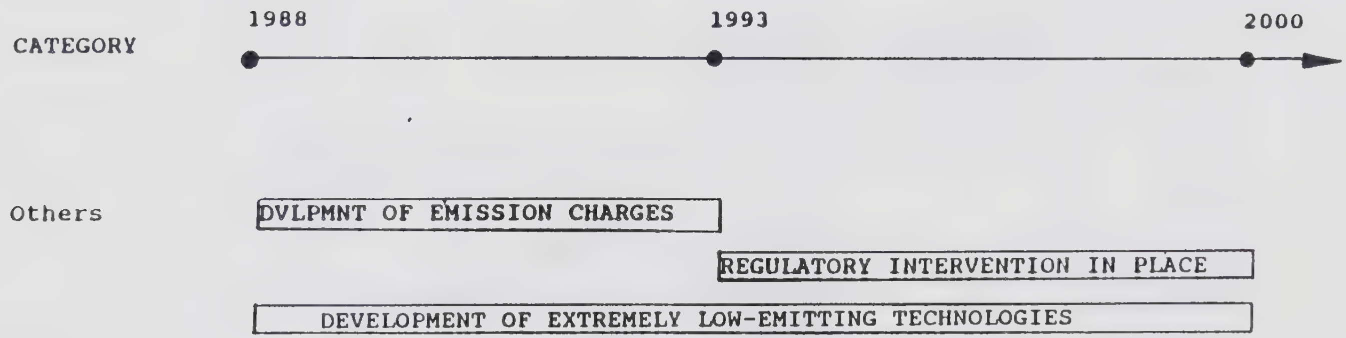


FIGURE 6-3B

Transportation Sources:

Tier II Implementation Schedule And Activities

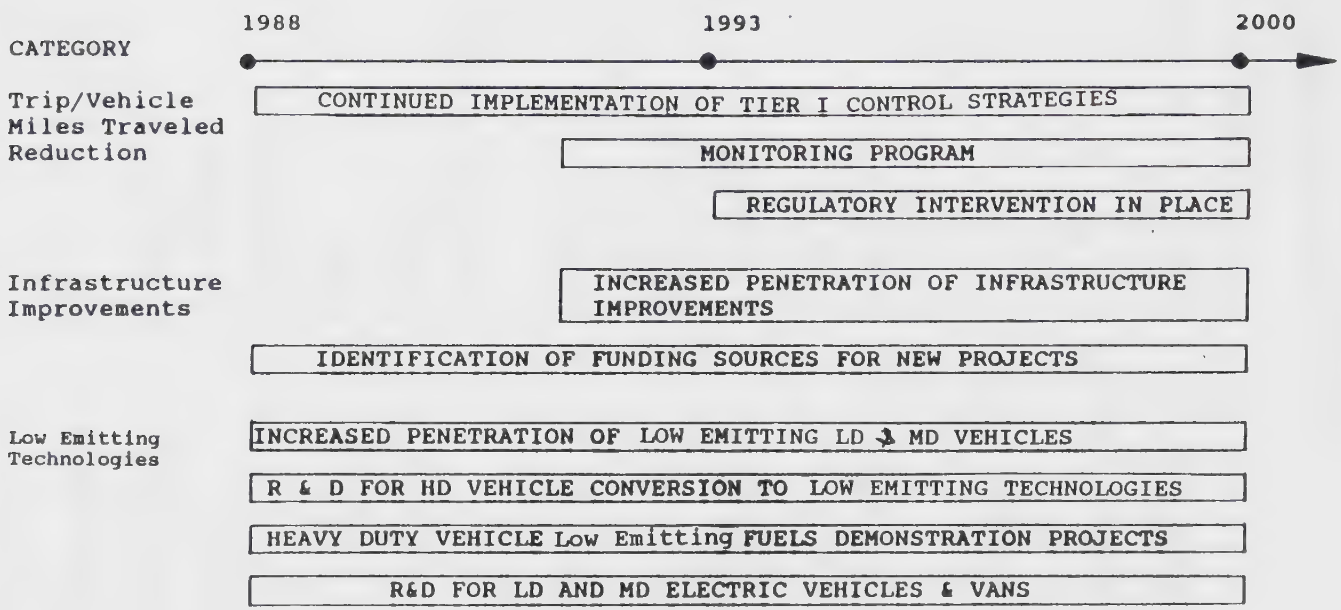


TABLE 6-7

Technology Advancement Projects

Subject	Agency	Date
Reformulation Of Solvents & Coatings	District	1988-1998
Alternative Solvent Application Methods (e.g., Robotic, UV)	District	1988-1998
Nonrecurrent Congestion Relief	SCAG	1988-1989
Export Fees	District	1988-1992
Emissions From Refinery Flares	District	1988-1989
Industrial Electrification *Projects*	District	1988-1998
Electric Vehicles (e.g., Battery powered, Fuel cell-powered)	District/CEC/ ARB/Utility	1988-1998
Clean Fuel Heavy Duty Vehicles	District/ARB	1988-1998
Out-Of-Basin Transportation Of Biodegradable Solid Waste	SCAG	1989-1990
Electrical Energy Supply and Distribution	District/CEC/Utility	1989-1998
Methanol in Refinery Heaters	District	1989-1990
Fuel Cells (>100 MW)	District	1989-1993
Electric Vehicle Battery	District/CEC	1989-1995
PM Fugitive Emissions Data	District/ARB	1989-1991
Phase-I Vapor Recovery Systems	District/ARB	1990-1992
Economic and Environmental Impacts of Source Substitution	District	1990-1992
Railroad Electrification Feasibility Study	District/SCAG	1991-1992

TABLE 6-8
Demonstration Projects

Project	Responsible Agency	Date
Electric Vehicles	District/CEC/ ARB/Utility	1988-1998
Clean Fuel Heavy Duty Vehicles	District/ARB	1988-1998
Methanol in Refinery Heaters	District	1990-1991
Highway Electrification and Automation	District/Caltrans/ SCAG	1990-1998
Fuel Cells (11 MW)	District	1990-1993
Robotic Coating Operations	District	1990-1995
Phase-I Vapor Recovery System	District/ARB	1991-1992
Building Materials/Methods Study	District	1991-1992

TABLE 6-9

Legislative Needs

Subject	Agency	Secured By
Funding For Transportation Infrastructure	Caltrans/SCAG/ CTC'S	1989
Emission Charges	District/ARB	1990
Authority for Retrofit of Particle Traps	ARB	1990
Authority To Lower Gasoline Vapor Pressure	ARB	1990
Export Fees	District	1992

TIER III IMPLEMENTATION

Achievement of Tier III goals depends on substantial technological advancements and breakthroughs that are expected to occur throughout the next two decades. This requires an aggressive expansion of Tier II research and development efforts. After achieving Tier II goals, Tier III measures must be implemented on an accelerated schedule to achieve attainment by 2007. Figure 6-4 shows the proposed Tier III implementation schedule and activities.

The District, in conjunction with *federal, state*, local, and regional agencies, will be responsible for ensuring that Tier III strategies are implemented, and that the emission reduction goals are met. These agencies would need to develop annual work plans and document their progress.

FIGURE 6-4A

Stationary Sources:

Tier III Implementation Schedule And Activities

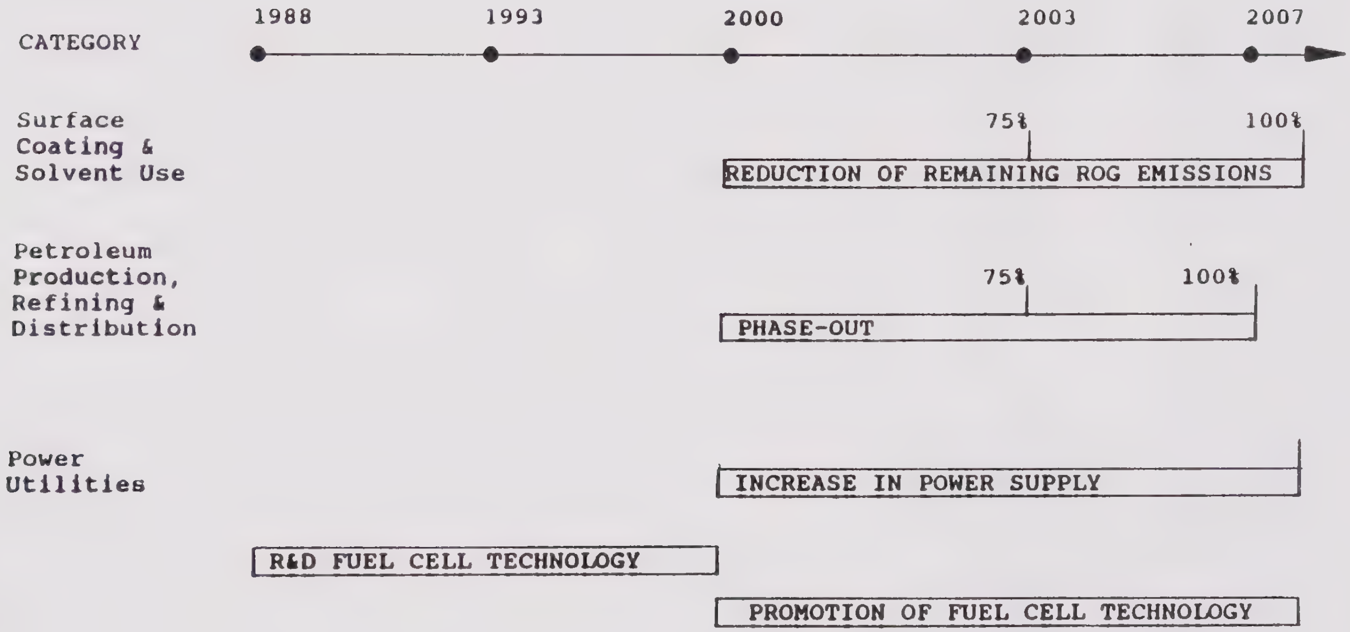
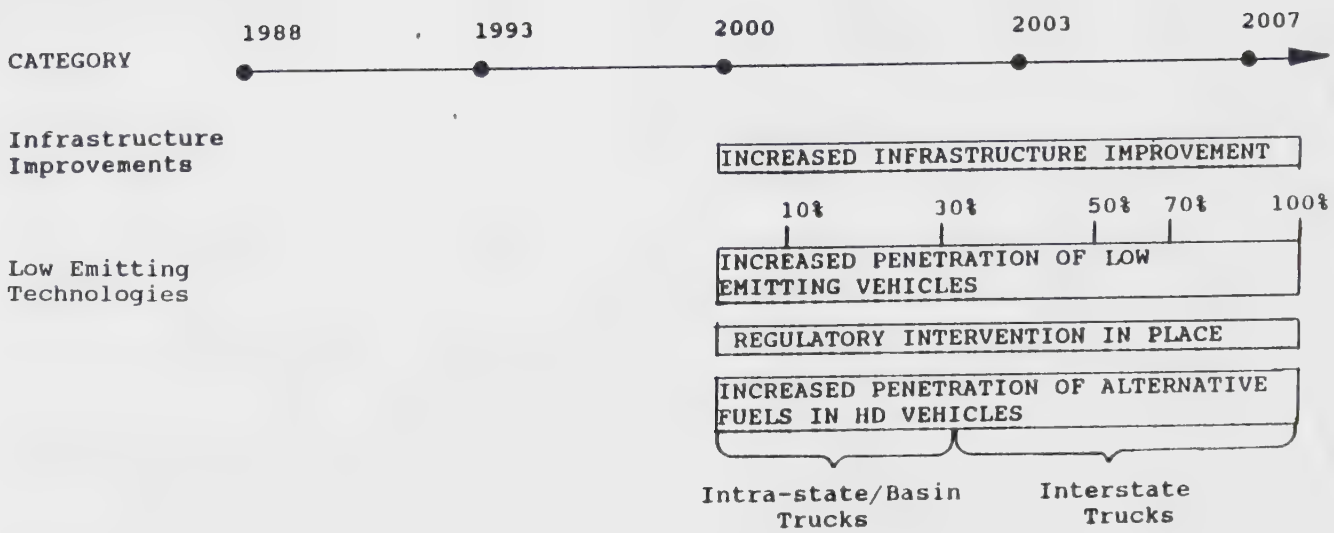


FIGURE 6-4B

Transportation Sources:

Tier III Implementation Schedule And Activities



CONTINGENCY PLAN DEVELOPMENT

In order to achieve the air quality improvements identified in the AQMP, the measures listed in the Plan must be adopted within the timeframes identified, and they must result in the projected emissions reductions. The ongoing air quality planning process includes an audit program (the Reasonable Further Progress report process) to verify progress toward attainment goals.

If control measures are not adopted by the date specified, or if they do not result in the hoped for emissions reductions, the District must take one of two course of action. First, measures scheduled for later adoption or implementation can be brought forward for earlier action. *Secondly,* certain "contingency" measures could be instituted in place of the Plan measures. Table 6-10 lists currently proposed contingency measures, actions needed prior to implementation, and responsible agencies. Furthermore, control measures deemed viable in the future will be added to the contingency measures list to provide additional options.

TABLE 6-10

Contingency Program

AQMP Measure No.	Title	Responsible Agency	Activities	AQMP Appendix No., Page No.	AQMP Addendum No., Page No.
T-1	Emission Charges on Gasoline and Diesel Fuels Used by Motor Vehicles [All Pollutants]	District	Further Study/ Legislative Authority	---------	IV-A, pp. 29-33
T-2	Limits of Vehicle Registration [All Pollutants]	State	Further Study	IV-A, pp.H5-H7	----------
T-3	Emission Charges on Parking Lots [All Pollutants]	District	Further Study/ Legislative Authority	---------	IV-A, pp. 38-41
T-4	Emission Charges on Vehicle Use [All Pollutants]	District	Further Study/ Legislative Authority	---------	IV-A, pp. 42-44
T-5	Reduction of VMT to 1985 Levels [All Pollutants]	SCAG	Expanding Tier I Programs	IV-A, pp. 113-114	---------
T-6	Highway User Fees [All Pollutants]	SCAG	Further Study/ Legislative Authority	IV-G, pp. 285-291	
T-7	Oxygenated Fuels Program [CO]	District	Further Study	--------	IV-A Modifications, pp. M16-M19
T-8	Time and Place Control Measures	District/ SCAG	Further Study	--------	IV-A Modifications, p. M20

SUMMARY OF APPENDICES

Appendices to Chapter 2
Appendices to Chapter 3
Appendices to Chapter 4
Appendices to Chapter 5

APPENDICES TO CHAPTER 2

Appendix II-A
1985 Summary of Air Quality in California's South Coast Air Basin

This appendix presents a detailed analysis of the Basin's air quality for 1985, including comparisons of pollutant concentrations with federal and California ambient air quality standards. The report analyzes visibility as well as the criteria contaminants which are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, PM10, total suspended particulates, lead, sulfate, nitrate.

Appendix II-B
1986 Update to 1985 Summary of Air Quality in California's South Coast Air Basin

This appendix contains 1986 ambient air quality statistics and comparisons of pollutant concentrations with federal and California ambient air quality standards.

Appendix II-C
Air Quality of Reasonable Further Progress Report for 1986 on the Implementation of the 1982 Air Quality Management Plan

This appendix is chapter 7 of the 1986 Reasonable Further Progress Report. The chapter describes the air quality in the South Coast Air Basin from 1975 through 1986 and presents statistics on current air quality and existing trends. The pollutants discussed are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, PM10, total suspended particulates, sulfate, and lead.

APPENDICES TO CHAPTER 3

Appendix III-A
1985 Emissions Inventory: South Coast Air Basin

Appendix III-A documents emissions data on air contaminants in the South Coast Air Basin for the base year 1985. Total organic gases (TOG), reactive organic gases (ROG), oxides of nitrogen (NO_x), carbon monoxide (CO), particulate matter (PM), and oxides of sulfur (SO_x) are included in the inventory. Emissions from both stationary and mobile sources are presented by spatial distribution and by major source and control categories. This information provides a baseline for regional air quality modeling and forecasting.

Appendix III-B
Future Baseline Emissions: South Coast Air Basin

Appendix III-B presents baseline emissions forecasts for the years 2000 and 2010 in the South Coast Air Basin. Baseline emissions are those emissions levels predicted to occur if no additional air quality regulations are introduced. These emissions are forecasted from the base year 1985 and are based upon control measures in effect prior to December 31, 1987, as well as a specific set of growth rates for population, industry, and motor vehicle activity provided by the Southern California Association of Governments.

Appendix III-C
PM10 Emissions Inventory and Forecast: South Coast Air Basin

This appendix summarizes emissions of PM10 (particulates with an aerodynamic diameter of less than or equal to 10 microns) within the South Coast Air Basin for the base year 1985 and baseline emissions of PM10 forecasted for the years 2000 and 2010. The emissions for all three years are characterized in terms of size distribution and chemical composition for both mobile and stationary sources. The baseline emissions levels for 2000 and 2010 are predicted to occur if no new controls are introduced after December 31, 1987. This prediction is based on a specific set of projected growth rates for population, industry, and motor vehicle activity. Appendix III-C was prepared by the South Coast Air Quality Management District

Appendices III-A, III-B, and III-C Addendum
1985 Emissions Inventory and Future Baseline Emissions For the South Coast Air Basin

This addendum addresses specific questions received from the public concerning emissions and summarizes information which became available after publication of Draft Appendices III-A, III-B, and III-C. It is primarily concerned with emissions from vegetative sources, relative reactivity of organic gases, and uncertainties in emission estimates.

Appendix III-D
Baseline Projection

This appendix presents a Draft Baseline Projection for population and employment through the year 2010. The Draft Baseline Projection is defined as a calculation of what the population and employment growth of the SCAG region would be if current demographic and economic trends continue and if no new governmental policies are adopted and implemented. This appendix describes population and employment projections in the SCAG region and discusses the methodology and assumptions used in these projections. This appendix was prepared by the Southern California Association of Governments.

APPENDICES TO CHAPTER 4

Appendix IV-A
Tier I and Tier II Control Measures

Appendix IV-A contains a detailed description of proposed Tier I, Tier II, and contingency control measures for the 1988 AQMP revision.

Tier I measures are based upon technological applications which are currently available and can be adopted within the next five years. The Tier I control measures presented in this report are divided into two major impacted sources: stationary and transportation. Stationary sources contain six subgroups: surface coating and solvent use, petroleum and gas production, industrial and commercial processes, residential and public sectors, agricultural processes, and others. Transportation sources

contain three subgroups: motor vehicles, transportation system and land use, and off-road vehicles.

Tier II control measures provide further emission reductions. They are directed at demonstrated technologies which require further advancement or improvements which can reasonably be expected to occur within the planning time frame. Tier II control measures include penetration of low-emitting vehicles in the transportation sector, low ROG products and applications of surface coating and solvent use, emission charges and more stringent control technologies for stationary sources, and stricter emission standards for off-road vehicles.

Appendix IV-A Addendum
Tier I and Tier II Control Measures

This addendum to Appendix IV-A provides information which became available after the June printing. It reflects comments received during the review period and corrects any errors or omissions in the original document. Several contingency measures were added to the Plan.

The information in the addendum contains changes to existing measures as well as new measures. Contingency measures are control measures which provide additional emission reductions if certain control measures included in the draft AQMP fail to be implemented or do not result in expected reductions. Contingency measures include emission charges on gasoline and diesel fuels, limits on vehicle registration, emission charges on parking lots and vehicle use, reduction of VMT to 1985 levels, user fees, an oxygenated fuels program, and time and place control measures.

Appendix IV-B
Tier III Control Strategy: Energy Future

Conventional add-on control devices have not sufficiently controlled emissions from fuel combustion processes. As a result, the District is considering low emitting technologies to further control fuel combustion emissions, especially NO_X and ROG in the case of motor vehicle emissions. Electric technology is considered as one of the potential viable options. However, if electrification is chosen, the increased power demand and the trade-offs between emissions from fuel combustion and power generation are major concerns. Therefore, this appendix is designed to examine the additional power generation required, the available energy alternatives,

the emission reduction potential, and other impacts associated with an electrification option.

Appendix IV-C
Tier III Control Strategies: Solvent Future

The primary objective of this appendix is to identify the potential ROG reductions possible from minimizing or eliminating reactive organic compounds in the solvent use emission categories. Control techniques discussed include: improved operating practices; use of alternative non-reactive solvent-based methods; increased transfer efficiency; process modifications; use of add-on control devices; reformulation of products; and banning of products or processes unable to adopt one of the preceding control techniques. This appendix to the 1988 AQMP presents viable long-range alternatives to the continued use of photochemically reactive organic solvent bases in consumer products and in coating and solvent cleaning operations. Substantial reductions are required for ROG emissions (identified as precursors to ozone formation) because the South Coast Air Basin will not attain the federal standard for ozone even after full implementation of Tier I and II control measures.

Appendix IV-D
Discount Cash Flow Method as Applied to the Cost Analysis of Control Measures

This appendix discusses two ways to calculate costs, Levelized Cash Flow (LCF) and Discounted Cash Flow (DCF). The LCF method, derived from the DCF method, calculates annualized costs by first multiplying capital costs by a capital recovery factor, and then adding the result to the operating costs. The DCF method determines the cost-effectiveness of a control measure. It first determines the present value of the costs of buying and operating the control equipment over the equipment life, and then divides this value by the emissions reduced over that period. The AQMP uses the DCF method for estimating control costs.

Appendix IV-E
Methanol

In order to attain state and federal air quality standards within the South Coast Air Basin, the use of alternative clean fuels including, but not limited to, methanol, compressed natural gas, propane, hydrogen, and solar energy, is considered.

Alternative clean fuels are defined as those which produce less ROG, NO_x, CO, and PM than conventional fuels and are at least as clean as methanol when burned in an internal combustion engine, turbine, or boiler. Alternative clean fuels play a role in achieving the Plan objectives.

This appendix supports the AQMP. It includes reprints, selected from several publications, on the applications of methanol. It also contains a bibliography on the topics related to methanol including technology development and evaluation, light/heavy-duty vehicle emissions data and test programs, health and environmental effects, production, distribution, and economics.

Appendix IV-F
California's Post-1987 Motor Vehicle Plan For Continued Progress Toward Attainment of the National Ambient Air Quality Standards For Ozone And Carbon Monoxide

This appendix describes the 1988 Update to the Air Resources Board's Post-1987 Motor Vehicle Plan. The plan consists of measures which would contribute to the efforts to achieving State and National Ambient Air Quality Standards. Eleven measures have already been adopted, sixteen measures are under regulatory development, and twelve measures may lead to further emission reductions. Individual reductions for the state's various non-attainment areas are also provided in this appendix, which was prepared by the Mobile Source Division of the California Air Resources Board. The emission reduction impact of fourteen of these measures was analyzed for the South Coast Air Basin. This analysis also includes likely adoption and implementation dates.

Appendix IV-G
Transportation, Land Use, and Energy Conservation Measures

This appendix presents the Southern California Association of Governments' proposed transportation, land use, and energy conservation measures. The measures contained in the document primarily involve mobile sources and are addressed in terms of how they relate to demand management, jobs/housing balance, and alternative energy sources.

APPENDICES TO CHAPTER 5

Appendix V-A
Annual NO_2 Dispersion Model Development and Applications in the South Coast Air Basin

Appendix V-A discusses the development of annual NO_2 dispersion model and the model's applications in the South Coast Air Basin. First, existing NO_2 modeling techniques are reviewed and then a new modeling approach which incorporates other features such as continuous hourly inputs, use of actual hourly NO_2/NO_x ratios, etc., is proposed. Second, input requirements for the model are discussed. Third, source, meteorological, and air quality data inputs used to project future NO_2 air quality are described. Fourth, projected source contribution and the annual average NO_2 concentrations for three base years and three tiered control options are presented. Finally, projected annual average NO_2 concentrations for three base years and under three control options at five stations in the Basin are depicted.

Appendix V-B
PM10 Modeling in the South Coast Air Basin of California

The objective of this paper is to present a proposed integrated PM10 analytical/modeling approach for the South Coast Air Basin (SoCAB). This modeling approach will be used as the basis for PM10 model development and application for the PM10 SIP Revision. In addition, a method to identify the most cost-effective control strategy for meeting the PM10 standards has been formulated. The method provides optimum selection of control measures for both directly-emitting (primary) sources of PM10 and for sources emitting precursors of PM10, such as SO_x, NO_x, and ROG. In the SoCAB this approach will be used in conjunction with other methods to identify cost-effective control strategies for all SoCAB air quality problems.

Appendix V-C
PM10 Water Content Measurement

The South Coast Air Quality Management District recently completed a special monitoring study to determine the composition and water content in PM10 samples collected in the South Coast Air Basin and the Coachella Valley. The objectives of

this special study were (1) to quantify the water content in PM10 samples collected, and (2) to determine the technical feasibility of developing a methodology which can be used to quantify the fraction of the water content that can be reduced with emission controls.

Results of the study are summarized based on the data gathered.

Appendix V-D
PM10 Water Apportionment Modeling

Atmospheric aerosol consists of a mixture of sulfates, nitrates, ammonium, chloride, elemental and organic carbon, dust, and water. The relation between aerosol size, composition, and relative humidity is of interest in the study of aerosol chemistry and visibility in polluted atmospheres. The importance of particulate water is that it affects aerosol size composition distribution, thus influencing the total particulate mass and its optical properties.

The main body of the present report is organized into three parts. In the first part the equilibrium program SEQUILIB is used to study aerosol behavior under different atmospheric conditions. A major result from this study is that the aerosol water is dependent on the concentrations of the other condensible species, which are HNO_3, NH_3 and H_2SO_4. Thus, reducing the concentration levels of NO_x and SO_2 in the atmosphere is predicted to reduce the total aerosol mass; not only are aerosol nitrates and sulfate reduced, but there is also a substantial reduction of the unbound water associated with them.

In the next part of this report, the existence of water in the aerosol phase at low relative humidity is explained by using thermodynamic arguments in order to predict the water content of supersaturated solutions. Finally, an analysis of the measured SCAQMD aerosol data is performed. The model calculations predict higher water concentrations than those measured, indicating that further measurements are necessary to resolve this discrepancy. A conclusion that can be drawn from this study is that by storing the aerosol filter samples in an uncontrolled environment, the total aerosol mass and composition, including the water content, may be substantially altered. An alternative approach to the SCAQMD 'conditioning' protocol could be to use the SEQUILIB model to predict the aerosol water content, given the concentrations of the other inorganic aerosol species. The SEQUILIB model may also be used by SCAQMD to predict the effect (on water) of controlling sulfate and nitrate.

Appendix V-E
PM10 Water Measurement Method

An electrochemical method, based on Karl Fischer titration, was used for determining the moisture content of PM10 aerosols which has been collected on quartz fiber filters at various sites in the South Coast and Southeast Desert Air Basins. The specific objective of the present study was to evaluate the feasibility of using the coulometric method for determining the moisture content of PM10 aerosols on quartz fiber filters (Whatman QM-A microfiber) conditioned for 24 hours at 25^{o}C and 45 percent R.H. (as required by the EPA). The Whatman QM-A quartz fiber filters are currently being used in NASN and regional air monitoring networks throughout the U.S. The moisture content derived in this fashion should include all the loosely bound or hydrated water which might be released under the stated heating conditions (20 min. at 130^{o}C). Subsequent studies are intended to use thermodynamic considerations to apportion water among various hygroscopic species that might be present in the collected aerosol.

Appendix V-F
PM10 Nitrate Decay Study

The South Coast Air Quality Management District and the California Air Resources Board jointly conducted a measurement study to determine the magnitude of nitrate in the South Coast Air Basin. The loss of nitrates from PM10 samples collected through the District's sample gathering and measurement procedure was recently documented. The objective of this study is to account for the loss of nitrates from PM10 samples collected in 1985 so that accurate PM10 concentrations can be used preparing the AQMP revision. A new procedure has been implemented at the District to minimize this deficiency.

Appendix V-G
PM10 Source Composition Library for the South Coast Air Basin

The primary objective of this report is to provide experimental documentation for the source profiles which were developed as part of this study, and to present the source profile library and user's guide.

An experimental plan to develop source profiles was developed that included characterization of vehicle exhaust, vehicle profile evaluation with tunnel aerosol measurements, and direct profile measurements of entrained soil and road dust,

fluid catalytic converters, construction and demolition, coke calciners, and rock crushers. Source profiles for the remaining sources were to be developed from values previously reported in the literature.

The report is divided into three volumes. Volume 1 provides documentation of the experimental methods and a discussion of the results. Part I of this first volume is devoted entirely to motor vehicle emissions, while Part II discusses methods and results of the other sources characterized as part of this study.

Volume II is the hard copy of the source profile library. It is a self contained document that includes a user guide to library tables and profiles, a guide to the library software located in a pocket at the back of the volume, and source composition tables and profiles.

Volume III consists of miscellaneous appendices relevant to the discussion presented in Volume I.

Appendix V-H
Chemical Characteristics of PM10 Aerosols Collected in the Los Angeles Area

A PM10 monitoring network was established throughout the South Coast Air Basin (SoCAB) in the greater Los Angeles region during the calendar year 1986. Annual average PM10 mass concentrations within the Los Angeles metropolitan area ranged from 47.0 $\mu g\ m^{-3}$ along the coast to 87.4 $\mu g\ m^{-3}$ at Rubidoux, the furthest inland monitoring station. Measurements made at San Nicolas Island suggest that regional background aerosol contributes between 28 to 44 percent of the PM10 aerosol at monitoring sites in the SoCAB over the long-term average. Five major aerosol components (carbonaceous material, NO_3, SO_4, NH_4, and soil-related material) account for greater than 80 percent of the annual average PM10 mass at all on-land monitoring stations. Peak 24-h average mass concentrations of nearly 300 $\mu g\ m^{-3}$ were observed at inland locations, with lower peak values ($\approx$130-150 $\mu g\ m^{-3}$ measured along the coast. Peak-day aerosol composition was characterized by increased NO_3 ion and associated ammonium ion levels, as compared to the annual average. PM10 mass concentration seems to depend only weakly on the season of the year. This lack of pronounced seasonal dependence results from the complex and contradictory seasonal variations in the major chemical components (carbonaceous material, nitrate, sulfate, ammonium ion and crustal material). At most sites within the Los Angeles metropolitan area, PM10 mass concentrations exceeded both the annual and 24-hour average federal and State of California PM10 regulatory standards.

Appendix V-I
Factor Analysis Screening of Source Profiles for Analysis of Los Angeles PM10 Data

Application of CMB modeling requires a knowledge of the composition and number of the sources of airborne particulate in the airshed. Existing libraries of source composition profiles usually offer several choices for each source category. Therefore it is difficult to choose the profile most representative of the emissions in the study area.

As pointed out in Javitz et al. (1988), factor analysis offers a means for screening the available source profiles in order to find the ones most consistent with the observed data. If a source is indeed contributing to the airborne particulates, then the source profile should be expressible as a linear combination of the significant eigenvectors of the data cross product matrix (Henry, 1987).

Resuspended urban dust and vehicle tailpipe emissions were expected to be the two major sources of primary particulates in the Los Angeles area. Thus, a study was conducted by NEA, Inc. to characterize the street dust and tailpipe emissions in the Los Angeles area by direct measurement (Cooper et al., 1987). The source profiles developed by this study were to be tested, through target transformation factor analysis, for consistency with observed atmospheric elemental concentrations.

Appendix V-J
Chemical Mass Balance Results

This appendix contains the PM10 Chemical Mass Balance (CMB) receptor modeling results for all 24-hour average samples collected every sixth day in 1986 at seven sites: Long Beach (LB), Hawthorne (HW), Burbank (BB), Downtown Los Angeles (DL), Anaheim (AN), Riverside (RV), and Upland (UP). The results are arranged by site and presented in chronological order with modeling results for one 24-hour sample contained on each page. At the top of each page the name of the sampling site, the date sampled, and the chi-square statistic is given.

The modeling results are presented in two tables. The first table displays the CMB prediction on contributions of various source categories to the 24-hour average PM10 concentrations. It contains the library number and mnemonic for each source class, the size fraction of the source profile, the source contribution with standard error, and the percent of PM10 source class contribution to the observed (measured) PM10 concentration. The size classifications are: T = Total PM10, C = Coarse (PM 2.5-10 μm in diameter), and F = Fine (PM < 2.5 μm in diameter).

Table 1 lists the descriptions corresponding to the source library and mnemonic for all the PM10 source categories.

The second table lists the model performance for each of the fitting chemical species. It includes the name of each species, along with the measured mass, the percent of the PM10 mass, the CMB calculated mass, and the calculated/measured mass ratio. The fitted species are marked with an asterisk. The observed PM10 mass, as measured by gravimetric analysis, appears at the bottom of this table.

Appendix V-K
Receptor Modeling for PM10 Source Apportionment in the South Coast Air Basin of California

The CMB technique has been applied to PM10 data in the South Coast Air Basin of California to determine source contributions to annual average PM10 mass. Air quality measurements were taken every sixth day at nine sites for a twelve month period beginning in January, 1986. The filter samples were analyzed for daily average concentrations of PM10 mass, organic carbon, elemental carbon, 34 trace metals, sulfate, nitrate, chloride, and ammonium ions. At one location (Downtown Los Angeles), both PM10 and fine particle (diameter less than 2.5 μm) samples were collected. A source signature library, documenting the chemical composition of PM10 emitted by owner 150 source types, has been compiled. Where necessary, source testing has been performed to construct chemical signatures for source types unique in the air basin. Both PM10 and fine particle source profiles have been prepared.

The CMB calculation was performed on each individual 24-hour sample using site-specific source profiles. Factor analysis was used to assess the compatibility of the source profiles with the ambient data. Annual average source apportionment of primary (directly emitted) PM10 species at each site was determined by averaging the 24-hour source category contribution factors weighted by the PM10 mass of each 24-hour ambient sample. The resulting annual average contributions to PM10 mass by each source category at each location is discussed.

Appendix V-L
Annual PM10 Dispersion Model Development and Application in the South Coast Air Basin

This appendix describes the development and application of the annual PM10 dispersion model. The model is a mathematical description of the atmospheric transport and chemistry of fresh emissions of inorganic sulfur and nitrogen containing pollutant species over an air basin. The model is applied to determine the sources responsible for the ambient loading of particulate nitrates and sulfates. It employs a Lagrangian Particle-In-Cell technique to predict long-term average concentrations of secondary pollutants such as particulate nitrate and sulfate. The calculation procedure is formulated to simulate atmospheric transport processes including ground-level dry deposition and vertical diffusion. Attention is given to the mixing of pollutants in the vertical direction close to sources. The chemical transformation from NO_x and SO_x to nitrate and sulfate, respectively, is treated as a pseudo-first order process.

The model is used to predict 1985 annual average sulfate and nitrate PM10 concentrations (particulate matter less than 10 μm aerodynamic diameter) in the SoCAB. The transport and chemical transformation of fresh emissions of NO_x and SO_x in the SoCAB from sixteen source classes is simulated by the model. Application of the air quality model generates information regarding the contribution to PM10 nitrate and PM10 sulfate concentrations from each of the sixteen source classes.

The particle-in-cell model developed at the Environmental Quality Laboratory (EQL) at the California Institute of Technology by Cass (1977) and modified by Gray (1985) is reviewed. The theory of this modeling approach is summarized. The results of previous model applications, designed to determine the sources responsible for atmospheric concentrations of sulfate and carbonaceous particulate matter, are discussed. Enhancements to the EQL model for the present study are outlined. Data requirements for model application are stated and satisfied. An inventory of NO_x and SO_x emissions is compiled for a 225 by 100 km grid centered over the SoCAB. Sixteen source classes are identified, and NO_x and SO_x emissions are matched to the model in such a way as to represent spatial and temporal emissions trends. Meteorological data are collected, and other data requirements and approximations necessary for execution of the air quality model are discussed. Results of the air quality model application, in the form of relative source class contributions to atmospheric particulate nitrate and sulfate concentrations, are presented and summarized.

Appendix V-M
Development of a Chemical Transformation Submodel for Annual PM10 Dispersion Modeling

This report describes the development of a chemical transformation submodel for use in the SCAQMD's long-term PM10 dispersion model.

SCAQMD's program to develop PM10 air quality models involves adapting and enhancing existing models that have been successfully employed for modeling pollutants in the SoCAB. Cass (1977) successfully applied a Particle-In-Cell (PIC) Lagrangian dispersion model for monthly-average and annual-average sulfate. Gray (1986) updated this model and successfully applied it to fine carbonaceous aerosol in the basin. Hence, the PIC model including transport, dispersion, and deposition algorithms was selected as the starting point for the SCAQMD's new annual PM10 application. Since the ambient PM10 data from the SoCAB indicate nitrate and sulfate are significant contributors to PM10 (Gray et al., 1988), one of the essential tasks in adapting the PIC model to PM10 was upgrading the chemical transformation rate submodel (Liu, et al., 1986).

The SCAQMD contracted ERT, Inc. to develop and test a chemical transformation submodel suitable for annual modeling of PM10 nitrate and sulfate. The function of the submodel is to predict the first-order chemical transformation rates of nitrogen oxides (NO_x) and sulfur dioxide (SO_2) to PM10 nitrate (NO_3^-) and sulfate ($SO_4^=$), respectively, on an hourly basis. The PIC model requires using a fairly simple chemical submodel, since it cannot accommodate second-order reactions or additional transported species. Furthermore, since the PIC model assumes linear superposition of contribution from various sources, the chemistry operator must be linear in the precursor concentration. Thus, the atmospheric chemistry of NO_x and SO_2 is represented in a highly parameterized fashion in the submodel, and the chemical transformation rate expressions are only functions of routinely available aerometric parameters.

This report provides background information on the chemistry of nitrate and sulfate formation in urban atmospheres (Section 2) and describes the development and refinement of the new chemical transformation submodel (Section 3). Suggestions for evaluation of the submodel and the overall PIC model are provided in Section 4.

Appendix V-N
Parameterization of the Formation Potential of Secondary Organic Aerosols

The objective of this project is to develop the fractional aerosol coefficients needed by the SCAQMD for modeling PM10 organic concentrations in the SoCAB. This objective is met by carrying out the following tasks: (1) Compile emission rates for individual ROGs in the SoCAB, (2) Compile literature data for organic aerosol formation for each ROG, (3) Estimate organic aerosol formation for ROGs for which no literature data are available, and (4) Construct a table of fractional aerosol coefficients for all ROGs.

Appendix V-O
Evaluation of Control Strategies for PM10 Concentrations in the South Coast Air Basin

The effect of emission controls on PM10 concentrations (particulate matter less than 10 μm aerodynamic diameter) is estimated for future years using the results of receptor and dispersion models. Source contributions to annual and 24-hour average PM10 concentrations are computed for base case 1985 emissions. Emission projections, after taking potential growth into consideration, are used to predict PM10 concentrations in 2000 and 2010. Three levels of control, which would reduce direct emissions of PM10 and their precursors, are assessed with regard to the resulting PM10 air quality in 2010.

The procedure used for computing base case and predicted future year PM10 source contributions is presented. The results of special measurement studies, conducted to quantify the decay of nitrates and the water content in PM10 samples as well as to determine the "true" PM10 mass and the chemical structure of sulfates and nitrates, are included in the calculation. A number of control measures have been identified that could be used to reduce emissions of directly emitted PM10 and precursors of secondary PM10 species. The algorithm is applied to the results of receptor and dispersion model applications in order to estimate the effect of the emission reductions on PM10 air quality in the SoCAB.

Appendix V-P
Ozone Episode Representativeness Study for the South Coast Air Basin, January 1987

This appendix presents the results and recommendations of an ozone episode selection scheme for regional ozone model simulation. Historically, regional ozone modeling in the SoCAB has been conducted using the meteorological conditions of a single ozone episode which occurred on 26-27 June 1974. Since ozone episodes occur under a variety of meteorological conditions, the representativeness of the meteorology of a single episode has been the focal point for criticism of the District's regional modeling and air quality planning efforts.

A study was conducted which developed a statistical approach using the Classification and Regression Tree (CART) technique to classify all the days in a smog season into discrete groups according to their ozone formation potential as characterized by specific meteorological conditions. Ozone episodes which are representative of the major meteorological groups can be identified for modeling simulation based on this approach.

The final report resulting from this study comprises this Appendix. The report describes the CART methodology, presents an application of CART to define specific meteorological classes representative of ozone episodes, and provides recommendations for using CART for the selection and evaluation of regional ozone modeling days.

Appendix V-Q
Proposed UAM Ozone Modeling Protocol for the 1987 Air Quality Management Plan Revision, June 1987

This appendix presents the rationale and methodology used in selecting the 5-7 June ozone episode for AQMP ozone simulations. Modeling experts from government, industry, and academia who provided guidance and suggestions to the modeling approach are identified. Technical issues concerning UAM are discussed and an evaluation concerning UAM results from previous studies are included. Specific data input preparation procedures and statistical model performance goals are described.

Appendix V-R
Urban Airshed Model Performance Evaluation for 5-7 June 1985, August 1988

This appendix describes the UAM performance evaluation for the 5-7 June 1985 ozone meteorological episode used in the 1988 AQMP Revision for ozone. The appendix is divided into two parts because of the large amount of graphical data used in the UAM simulations. Part One contains descriptions of the characteristics of the 5-7 June 1985 ozone episode and UAM performance statistics. The air quality, meteorological, and emission inputs developed for the UAM are also included. Part One is divided into the following chapters: (1) Introduction and Overview, (2) Summary of UAM Data Input Preparation Procedures and Model Performance Goals, (3) The Urban Airshed Model, (4) Characterization of the 5-7 June 1985 Ozone Episode and Modeling Domain, (5) UAM Emissions and Aerometric Data Input Preparation Methodology, and (6) Evaluation of UAM Results.

Part Two contains plots of the measured meteorological data and plots of the input data used in the UAM simulations.

Appendix V-S
Summary of Urban Airshed Modeling Results, September 1988

The appendix presents a summary of UAM results used in the AQMP. Tables and figures are included which summarize the projection of future baseline emissions and air quality. An estimation of control strategy effectiveness is also provided.

The appendix also describes some important modifications of model inputs that were made to reflect the most recent developments and findings in emissions and aerometric data preparation. The recent developments include: (1) newly updated ROG speciation profiles for mobile source emissions, (2) revised treatment of boundary conditions using data collected during the South Central Coast Cooperative Aerometric Monitoring Program (SCCCAMP) period, (3) source category-specific formaldehyde emission estimates for stationary sources, and (4) diurnal temperature adjustment for mobile source evaporation emission.

Appendix V-T
Carbon Monoxide Modeling

Appendix V-T contains CO modeling results. First, the modeling approach used to project CO air quality in the Basin is discussed. Second, CO air quality data and emissions data for the 1985 base year are described. Third, projected CO emissions in the three baseline years and Tier-I, Tier-II and Tier- III control options are shown with a brief description of CO control measures. Finally, the projected maximum concentrations and frequencies of state and federal exceedances estimated at 22 air monitoring stations for the three baseline years and three control options are presented.

ATTACHMENT

MODIFICATIONS TO APPENDICES IV-A AND IV-G

Modifications to Appendix IV-A
Modifications to Appendix IV-G

MODIFICATIONS TO APPENDIX IV-A
TIER I AND TIER II
CONTROL MEASURES

The changes to Appendix IV-A since September 1988 are summarized as follows and the changes made after December 1988 are printed in italics:

Table 4-1
Revised Control Measures

AQMP Measure No.	Title	Comments
A-16	Further Emission Reductions from Perchloroethylene Dry Cleaning Operation [ROG]	Cost data revised
B-13	Further Emission Reductions from Valves, Pumps, and Compressors Used in Oil and Gas Production Fields, Refineries, and Chemical Plants [ROG]	Control methods modified
C-2	*Control of Emissions from Non-Utility Internal Combustion Engines [All Pollutants]*	*Clarification added*
C-9	Control of Emissions from *Stationary Gas Turbines* [NOx]	Control efficiency and cost data revised
D-2	*Out of Basin Transport of Biodegradable Solid Waste [All Pollutants]*	*Clarification added*
D-3	*Control of Fugitive Emissions from Publicly Owned Treatment Works [ROG]*	*Clarification added*
D-4	Control of Emissions from Swimming Pool Water Heating [NOx]	New Tier I measure
D-5	Control of Emissions from Residential and Commercial Water Heating [NOx]	New Tier I measure
E-2	*Control of Emissions from Livestock Waste [ROG, PM, NH_3]*	*Clarification added*
F-4	Control of Fugitive Emissions from Construction of Roads and Buildings [PM]	Cost data revised
F-8	*New Source Review [All Pollutants]*	*Clarification added*

Table 4-1
Revised Control Measures
(Continued)

AQMP Measure No.	Title	Comments
F-10	Phase-Out Stationary Source Fuel Oil and Solid Fossil Fuel Use [NOx,SOx,PM]	Emission reductions revised
F-11	Emission Minimization Management Plan [All Pollutants]	New Tier I measure
H-1	Banning of New Drive-Through Facilities [ROG, CO, NOx]	Emission inventory revised
I-7	Control of Emissions from Utility Equipment [All Pollutants]	Recategorization of control measure
T-7	Oxygenated Fuels Program [CO]	New contingency measure
T-8	Time and Place Control Measures [All Pollutants]	New contingency measure

Control Measure CM #88-A-16 **Further Emission Reductions from Perchloroethylene Dry Cleaning Operation**

COST EFFECTIVENESS

The control cost for this measure has been revised from $3,000 per ton to $7,000 per ton of ROG.

Control Measure CM #88-B-13 **Further Emission Reductions From Valves, Pumps, and Compressors Used in Oil and Gas Production Fields, Refineries, and Chemical Plants**

PROPOSED METHOD OF CONTROL

Based on the proposed Rule 1173, currently under rule-making process, the proposed leakless equipment alternative would be deleted as the primary method of control, and will be replaced by a more stringent inspection and maintenance program. The expected control efficiency for this measure is estimated to be about 60 to 90 percent in ROG reductions.

COST EFFECTIVENESS

The control cost for this measure is currently being evaluated by the District's Rules Division.

Control Measure CM #88-C-2 **Control of Emissions from Non-Utility Internal Combustion Engines**

PROPOSED METHOD OF CONTROL

The following addition will be made to this section:

"At present, there are several facilities which operate must-burn landfill and digester gas-fueled internal combustion engines for various on-site applications. These gaseous fuels are naturally derived by-products of the waste treatment process, generally containing significant amounts of methane, carbon dioxide and in the case of landfill gas, air. Since combustion of these must-burn fuels in IC engines could provide a more efficient and less polluting method of utilizing these fuels as compared with the net emissions using other methods, landfill and digester gas-fueled IC engines would not be subject to the proposed control method of substitution with electric motors. However, these units would be subject to emission standards set to assure their continuous operation in the most energy efficient and least polluting manner using appropriate control technologies."

Control Measure CM #88-C-9 — Control of Emissions From Stationary Gas Turbines

Based on the Addendum B to the Staff Report for Proposed Rule 1134, dated September 8, 1988, the following sections are updated:

PROPOSED METHOD OF CONTROL

The proposed NO_x emission levels and the corresponding compliance schedule are specified below:

1. By 30 months after date of adoption:

   (a) 42 ppm for gas/methanol firing and 75 ppm for oil firing for units from 0.3 MW to less than 10.0 MW.

   (b) 12 ppm for units 10 MW or larger

2. By 60 months after date of adoption:

   (a) 42 ppm for gas/methanol firing (no oil limit because methanol will be the standby fuel) for units from 0.3 MW to less than 2.9 MW or greater.

   (b) 25 ppm for units of 2.9 MW to 10 MW

   (c) 12 ppm for units 10 MW or greater

New units 0.3 MW or greater size must comply with a 9 ppm NO_x limit. Existing units burning landfill gas or digester gas by 30 months after date of adoption must comply with a 42 ppm NO_x limit and by 60 months after date of adoption must meet the 12 ppm NO_x limit.

EMISSIONS REDUCTION

NO_x emissions inventory and reductions are updated as follows:

Emissions (Tons/Day)	Year 1985	Year 2000	Year 2010
NO_x Inventory	17.5	37.7	37.7
NO_x Reduction	----	22.6	22.6
NO_x Remaining	----	15.1	15.1

COST EFFECTIVENESS

The average cost effectiveness is estimated to be \$3,500 per ton of NO_x reduced using steam injection technology.

Control Measure CM #88-D-2 **Out of Basin Transport of Biodegradable Solid Waste**

Modification is made to the following sections:

EMISSIONS REDUCTIONS

The emission inventories and reduction estimates are revised to be "undetermined" at this time pending further study, and assessment of the emission inventory for resource recovery facilities.

PROPOSED METHOD OF CONTROL

An additional paragraph will be added at the end of the Proposed Method of Control section as follows:

"Adoption of this measure will be contingent on sufficient rail electrification to allow for effective transport of waste out of the basin by railroad lines. In addition, a study will be conducted by the Sanitation District of Los Angeles County, Bureau of Sanitation of City of Los Angeles, and the solid waste management agencies of the Counties of Los Angeles, Orange, Riverside, and San Bernardino to determine the quantity of transportation related, and on-site emissions associated with out-of-basin waste disposal and the potential emission reductions achievable. If the study determines that out-of-basin transport is an effective control option, implementation of the measure utilizing this control concept will proceed to the maximum extent feasible considering all relevant factors. If potential emission reductions from out-of-basin transport of biodegradable solid waste are estimated to be minor or insignificant, alternative control methods utilizing the best available control technology at disposal sites within the basin will be developed."

Control Measure CM #88-D-3 **Control of Fugitive Emissions from Publicly Owned Treatment Works**

Modification is made to the following section:

PROPOSED METHOD OF CONTROL

The following statement will be deleted from this section;

"Also, there is a trend toward using "100 percent" secondary treatment which requires enclosing open systems and could facilitate the use of add-on control devices."

and will be replaced with the following statement:

"If a facility chooses to use a pure oxygen system which requires enclosing open systems, this could facilitate the use of add-on control devices. The use of alternative control methods other than those discussed above which are able to achieve equivalent fugitive ROG emission reductions will not be excluded from future consideration."

CONTROL OF EMISSIONS FROM SWIMMING POOL WATER HEATING [NO_x]

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SUMMARY

Source Category:	Swimming Pools (including spas and hot tubs)
Control Methods:	Installation of Flat Plate Solar Collectors
Emissions:	Not Determined
Control Cost:	Possible Long Term Savings
Other Impacts:	Fuel savings

****

DESCRIPTION OF SOURCE CATEGORY

Background

Currently in the District there are about 3.3 million natural gas fired water heaters using fuel at an average rate of about 65 cubic feet per day per unit. With about half a million swimming pools in Southern California, many of these water heaters are applied to heat pools and hot tubs. With the construction of new houses and residential buildings with swimming pools, or adding one to those existing residences without a pool, additional natural gas will be consumed to heat pools. In addition to residential swimming pools, there are commercial and recreational (i.e., hotels, sport clubs, and parks) swimming pools, almost all of which are heated with gas fired water heaters. The purpose of this control measure is to control NOx emissions from gas fired swimming pool water heaters. Solar water heating is a well developed technology which offers a means to reduce natural gas consumption and thus NOx emissions. This technique could specifically be applied to swimming pools heating, and its feasibility has been proven in other "sunshine" states like Florida.

Regulatory History

District Rule 1121 regulates NOx emissions from residential gas-fired water heaters, and has limited NOx emissions to 2.3 pounds per year per new unit since January 1, 1983. In addition, since the rule's adoption in 1978, the California Energy Commission (CEC) adopted ASHRAE-90 Standards (in 1978-79), which resulted in increasing the average seasonal efficiency from 46 to 55 percent (Messenger, 1987), with a corresponding emission reduction of 16 percent when all units are replaced.

At present, the District does not have a specific rule directed at swimming pool water heaters. The proposed measure would control NOx emissions from heating swimming pools in the Air Basin.

PROPOSED METHOD OF CONTROL

In order to control NOx emissions from natural gas fueled water heaters applied to swimming pools, all new installations of swimming pools with water heater will be required to install flat-plate solar collectors.

Other control technologies capable of achieving equivalent NOx emission reductions are not excluded from future consideration.

EMISSIONS REDUCTION

The NOx emission inventory from gas fired water heaters for heating swimming pools is currently not available and estimation of emission reductions from this source category requires further analysis.

COST EFFECTIVENESS

Due to unknown emissions inventory and reduction potentials, the cost effectiveness of the proposed control measure is uncertain at this time.

The initial equipment and installation cost of solar panel is estimated between $5,000 to $12,000 depending on the size of the pool. With the fuel savings this cost may be paid back in approximately 3-5 years (Eder, 1988).

OTHER IMPACTS

The solar panel installed for heating swimming pools may also be used for other water heating purposes.

In order to require solar panel on new swimming pool installations with heating system, the District may seek other local jurisdiction cooperation to includ the requirements in the building codes.

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CONTROL OF EMISSIONS FROM RESIDENTIAL AND COMMERCIAL WATER HEATING [NO_x]

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SUMMARY

Source Category: Commercial and Residential Water Heating

Control Methods: Installation of Solar Equipment

Emissions:

(Tons/Day)	Year 1985	Year 2000	Year 2010
NOx Inventory	13.3	10.7	12.3
NOx Reduction	Not Determined		

Control Cost: Cost Savings to $62,500 Per Ton of NOx Reduced

Other Impacts: Reduced Consumption of Natural Gas; Possible Adverse Impact on Commercial/Residential Building Cost; May Require Cooperation of Local Jurisdictions for Inclusion in Local Building Codes.

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DESCRIPTION OF SOURCE CATEGORY

Background

In the South Coast Air Basin there are currently about 3.3 million natural gas-fired water heaters in residential establishments using fuel at an average rate of about 65 cubic feet per day per unit. The average unit life is ten years. There are approximately 24,100 small commercial boilers of less than 5 MM Btu/hr heat input in the Basin. The majority of these boilers are less than 0.5 MM Btu/hr heat input, and are estimated to be used for only hot water heating. Average fuel consumption for all commercial boilers less than 5 MM Btu/hr is about 2250 cubic feet per day per unit. Roughly one quarter of all U.S. energy consumption is related to space heating, water heating and air conditioning (Eaton, 1976). Application of domestic solar water heating offers a means to reduce natural gas consumption and NOx emissions simultaneously. Solar water-heating technology, such as flat plate collectors can yield water with temperatures from $100^{O}F$ to $200^{O}F$ depending on conditions, and has been employed extensively to supply domestic hot water in many areas of the world with prevalent incident sunlight (Eaton, 1976). The use of solar water heating would be especially beneficial during the peak ozone months when the photoperiod is longer and incident radiation most intense. California State standards in hardware quality have been established for solar units. Federal and state tax incentives which previously promoted solarization are no longer in force.

Regulatory History

District Rule 1121 regulates the NOx emissions of residential gas-fired water heaters, and has limited NOx emissions to 2.3 pounds per year per new unit since January 1, 1983. Full compliance is expected by the end of 1992, when 3.64 million water heaters are expected in the District.

In addition, since the rule's adoption in 1978, the California Energy Commission (CEC) adopted ASHRAE-90 Standards (in 1978-79), which resulted in increasing the average seasonal efficiency from 46 to 55 percent (Messenger, 1987), with a corresponding emission reduction of 16 percent when all units are replaced.

Based on Measure N2 of the 1982 AQMP Revision (SCAQMD, 1982), this control measure is modified to incorporate the current District water heater NOx rule.

This measure differs from that originally proposed as D-2 in the June 1988 Policy Proposal in that it requires installation of solar equipment on new residential construction over 2,000 square feet, and all commercial construction, rather than replacement of all new and existing residential natural gas water heating systems with solar.

PROPOSED METHOD OF CONTROL

NOx emissions from natural gas-fired water heaters can be controlled by requiring the installation of solar equipment on water heating systems in all new residential multi- and single-family homes over 2,000 square feet, and all new commercial buildings . Nonconcentrating solar collectors, such as flat plate solar panels, are capable of providing sufficient domestic water heating capabilities. Conventional natural gas-fired water heaters would continue to be used to supplement the solar component.

On a yearly basis, solar energy could provide about 52 percent of the energy needed for a given water heating system, with the remaining 48 percent provided by the conventional natural gas unit in compliance with the District Rule 1121 and CEC standards.

Other control technologies capable of achieving equivalent NOx emission reductions are not excluded from future consideration.

EMISSIONS REDUCTION

Residential water heaters accounted for approximately 12.3 tons of NOx per day in 1985. This is expected to fall to 9.0 tons per day at the end of 2000 when Rule 1121 achieves full implementation. The emission estimate for 2010 is 10.2 tons per day due to population growth. NOx emissions for commercial water heating for 1985 are estimated at about 1.0 tons per day. Projections for 2000 and 2010 are estimated at 1.7 and 2.1 tons per day, respectively. Emission reductions are not estimated at this time and require further study due to uncertainty as to the number of new construction units requiring solar installation. Implementation of this measure may contribute to the SCAG Energy Conservation Measures.

COST EFFECTIVENESS

The solar panel equipment and installation costs for new homes with one flat plate collector is approximately $2,000, and can be financed over the life of the home. For new single- or multi-family houses, without any cost recovery at time of resale, the cost-effectiveness for solar panels was calculated to be $62,500 per ton of NOx reduced. However, for new homes, assuming that 50 percent of the solar panel cost can be recovered at resale, these panels can generate savings for the owner.

The equipment and installation cost for retrofitting existing homes with one flat plate solar collector unit is about $4,000, making the calculated cost-effectiveness unacceptably high (from $300,000 to over $500,000 per ton of NOx reduced). Control measure D-2, "Application of Solar Panels on Domestic Water Heaters", presented in the June 1988 Policy Proposal was deleted due to the high cost estimated for retrofit of all residential natural gas water-heating systems.

The cost effectiveness for using solar panels to heat water in a commercial setting is $9,600 per ton of NOx reduced.

OTHER IMPACTS

Residential and commercial natural gas consumption would be reduced in the Basin. Building costs for residential and commercial properties would increase depending on the number of solar collectors required to adequately provide suitable domestic hot water heating. The District would be required to seek the cooperation of local jurisdictions in including the solar water heating replacement requirement in local building codes.

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Control Measure CM #88-E-2 **Control of Emissions From Livestock Waste**

PROPOSED METHOD OF CONTROL

Anaerobic Digestors

The following sentence in this section will be revised to provide adequate flexibility for disposal method of waste effluent:

"The proposed digester *may* dispose of its waste effluent by feeding it into an existing industrial waste pipeline, the Santa Ana Regional Interceptor, which will transport it to a waste treatment facility in Orange County."

Control Measure CM #88-F-4 **Control of Fugitive Emissions from Construction of Roads and Buildings [PM]**

COST EFFECTIVENESS

The control cost for this measure has been revised from $9,300 to $4,650 per ton of PM.

Control Measure CM #88-F-8 **New Source Review**

PROPOSED METHOD OF CONTROL

The proposed control method described under "Proposed Method of Control" section in Appendix IV-A Addendum is deleted and is replaced with the following section:

"This measure calls for the redesign of District Regulation XIII to ensure that new emission sources and major modifications to existing sources do not impede expeditious attainment of air quality standards. Specific actions to achieve this objective will be defined during the rule development process because of the complexity of Regulation XIII and the variety of potentially viable options for revising it. However, the following criteria will be used for initial selection of potential modifications:

(1) Ensures no adverse air quality impact from new or modified sources;

(2) Complies with EPA requirements;

(3) Promotes consistency with other elements of the AQMP (e.g., job/housing balance); and

(4) *Promotes actions which reduce pollutant emissions from existing sources; these actions include eliminating offset penalties[1] based on distance when air quality improvement will result.*

At the time of this writing, several proposals for modification of Regulation XIII have been set forth by District staff and industrial and environmental organizations. Each of these is currently under review and will be judged in part according to the criteria given above.

1 *District Rule 1307 specifies additional offsets based on the equation [b(x)] where "b" is 0.01 and "x" is distance in kilometers."*

Control Measure CM #88-F-10 Phase-Out Stationary Source Fuel Oil and Solid Fossil Fuel Use

EMISSIONS REDUCTION

Methanol or other alternative fuels (e.g., propane) can be utilized during a natural gas curtailment, increases in power demand, and emergencies. Based on substitution of methanol for fuel oil, the NO_x, PM, and SO_x emissions reductions for the years 2000 and 2010 are as follows:

Emissions: (Tons/Day)	Year 1985	Year 2000	Year 2010
NO_x Inventory	22.0	27.6	30.2
NO_x Reduction	----	16.6	18.1
NO_x Remaining	----	11.0	12.1
PM Inventory	1.7	2.6	2.8
PM Reduction	---	2.2	2.4
PM Remaining	---	0.4	0.4
SO_x Inventory	10.8	15.9	16.0
SO_x Reduction	----	15.9	16.0
SO_x Remaining	----	0	0

EMISSION MINIMIZATION MANAGEMENT PLAN [ALL POLLUTANTS]

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SUMMARY

Source Category:	All Stationary Sources
Control Methods:	Emission Minimization Management Plan
Emissions:	See "Emission Reduction" Section
Control Cost:	See "Cost-Effectiveness" Section
Other Impacts:	None

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DESCRIPTION OF SOURCE CATEGORY

Background

Additional emission reductions are available in those categories directly targeted by source specific measures in the AQMP. One method by which to achieve these additional emission reductions is the adoption of an Emission Minimization Management Plan Rule. Adoption of such a rule would require all facilities coming before the District for construction or operating permits to attest on the permit application to the existence of an emission minimization plan. The objective of the plan would be to minimize air pollution through a practical approach involving management practices which may include: energy conservation measures such as, more efficient lighting, space heating and/or cooling, and water heating systems; alternative or flexible work schedules such as a four day work week or telecommuting, and carpooling or vanpooling; reduced fuel consumption through applying energy efficient equipment or process modifications; and reduced solvent use through source reduction and/or waste minimization programs.

Regulatory History

This measure is similar in concept to the stationary source curtailment and transportation management plan development required under Regulation VII. Addition of a section on the construction or operation permit attesting to the existence of an Emission Minimization Management Plan would resemble the Generator's Certification listed as item 16 on the RCRA Uniform Hazardous Waste Manifest.

PROPOSED METHOD OF CONTROL

The proposed measure would require that facilities further identify direct and indirect sources of emissions for reduction beyond mandatory requirements. Control methods to achieve the additional reductions may include: energy conservation measures such as, improved building insulation, more efficient lighting, space heating and/or cooling, and water heating systems; alternative or flexible work schedules such as, flextime, a four day work week, or telecommuting and greater use of public transportation, carpooling or vanpooling; reduced fuel consumption through application of energy efficient equipment or process modifications; and reducing solvent use through source reduction and/or waste minimization programs.

Facilities would be required to develop a plan, including a facility evaluation, a current emission inventory, and process or procedural changes under consideration which could reduce emissions. A copy of this plan may be kept on file with the permit to operate or construct. Preparation of such a plan would require facilities to demonstrate their individual commitment to improved air quality in the South Coast Air Basin, while providing flexibility in that the emission category and method of reduction are not mandated by the District.

EMISSIONS REDUCTION

The emissions from this category include all remaining emissions after application of mandatory rule requirements. Emissions reduction is uncertain at this time, however the District may set a target reduction goal based on the number of stationary sources requiring Emission Management Plans.

COST EFFECTIVENESS

The cost effectiveness values for this measure will vary depending on the type of control measures instituted by the facilities. Savings may be realized from a number of control methods including, but not limited to, reduced commuting by employees, decreased energy costs, and lower solvent usage from greater recovery and/or recycling.

OTHER IMPACTS

Positive impacts as a result of the proposed measure include greater facility awareness of impact on air quality and achievement of emission reductions that may not have occurred.

Control Measure CM #88-H-1 **Banning of New Drive-Through Facilities**

EMISSIONS REDUCTION

The emissions inventory as presented in this measure is in error and is currently being determined.

Control Measure CM #88-I-7 **Control of Emissions from Utility Equipment**

This control measure was previously numbered CM #88-D-4 and has now been moved to Category I: Off-Road Vehicles. This recategorization is to be consistent with the Sher Bill (AB2595) adopted on September 30, 1988..

OXYGENATED FUELS PROGRAM
[CO]

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SUMMARY

Source Category: All Gasoline Vehicles

Control Methods: Increased Oxygen Content of Gasoline

Emissions: (Tons/Day)	Year 1985	Year 2000	Year 2010
ROG Inventory	554	226	285
ROG Reduction	---	(Not Determined)	
CO Inventory	4,676	2,911	3,812
CO Reduction	---	(Not Determined)	
NOx Inventory	477	324	387
NOx Reduction	---	(Not Determined)	

Control Costs: Gasoline Price Increase of 0 to 2 cents per gallon. This is equivalent to Carbon Monoxide reduction cost of $112 to $543/ton. These costs are based on Colorado data.

Other Impacts: Increase in Oxides of Nitrogen Emissions, Fuel Economy Effect, Potential Evaporative Emissions Increase.

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DESCRIPTION OF SOURCE CATEGORY

Background

The use of an oxygenated fuel blend, such as gasoline with 10% ethanol, results in more oxygen for fuel combustion due to the oxygen contained in the additive. Fuel metering devices, such as carburetors or fuel injectors, usually meter fuel and air volumetrically. Thus, the extra oxygen in the fuel mixture results in less fuel and more total oxygen reaching the engine for fuel combustion. If the initial gasoline mixture is rich, this enleanment results in reduced exhaust ROG and CO emissions; however, it also causes an increase in vehicle NO_x emissions.

Regulatory History

The Colorado Air Quality Control Commission enacted its Oxygenated Fuels Program to take effect in the winter of 1988. This program requires oxygenated fuels to be sold in CO non-attainment areas each winter season. The Colorado 1988 program was in effect during January and February with a requirement for a minimum oxygen content of 1.5% by weight. In future years, the program will be in effect from November 1 through March 1. The minimum oxygen content requirement will be 2% by weight. The Colorado Oxygenated Fuels Program, as modeled, resulted in an 8% to 11% reduction in ambient CO levels. Arizona has implemented an oxygenated fuel program and Washoe County, Nevada plans to adopt a program that will begin in the winter of 1989.

PROPOSED METHOD OF CONTROL

The proposed method of control is to require a minimum oxygen content for gasoline sold in the Basin. The sale of oxygenated fuel may be limited to winter months with a minimum oxygen content of approximately 1.5% - 4%.

EMISSIONS REDUCTION

Exhaust Emissions

The following is EPA's conclusion concerning the exhaust emission changes with oxygenated blends for fuels with 3.7% oxygen (gasohol or methanol blends) and 2% oxygen (11% MTBE-metyl tert-butyl ether). Both CO and exhaust ROG decrease while NO_x increases. ROG emissions, in effect, are the non-methane hydrocarbons with adjustments made to account for the mix of true hydrocarbons, alcohols, and aldehydes that is expected with each blend. Because vehicle exhaust emissions with oxygenated fuels are still primarily true hydrocarbons, the adjustment is small. Specifically, EPA assumed that the effects of slightly increased alcohol and aldehyde emissions balance each other.

Percent Exhaust Emission Change Between Oxygenated Fuel and Gasoline With Varying Fuel Oxygen Content at Constant Fuel Volatility.

	3.7% Oxygen			2.0% Oxygen		
Technology	CO	NO_x	ROG	CO	NO_x	ROG
Non-Catalyst	-24.5	+3.3	-5.5	-13.2	+2.1	-3.0
Open-Loop Cat.	-34.9	+4.0	-15.6	-18.9	+2.2	-8.4
Closed-Loop Cat.	-21.4	+8.1	-5.1	-11.6	+4.4	-2.8

Evaporative Emissions

Evaporative emissions consist of hot soak and diurnal emissions. Hot soak emissions occur during the period immediately following engine shut-down. These

losses originate from both the fuel metering system and from the fuel tank. These emissions are greater from carbureted vehicles than from vehicles with fuel injection. Diurnal emissions consist of hydrocarbons both evaporated and displaced from the vehicle's fuel tank as the vehicle tracks the diurnal swing in ambient temperatures. Each day, as the fuel in the tank and the vapor above the fuel heat up, more of the liquid fuel evaporates and the vapor itself expands, with both phenomena causing hydrocarbons to be released into the atmosphere. If no adjustments are made to compensate for it, use of alcohol increases vapor pressure compared to the base gasoline. This increases evaporative emissions.

Additional Studies

Additional analysis is required before this control measure is undertaken. Tests need to be conducted on newer closed-loop vehicles that are equipped with "adaptive learning". Properly functioning vehicles with adaptive learning continuously adjust their open-loop fuel calibrations based on the most recent period of closed-loop operation. Thus, they can in theory compensate at least partially for fuel-caused enleanment even when the oxygen sensor is in control, such as during cold starts and heavy accelerations. They also may not run as rich in failure modes as simpler closed-loop vehicles. These vehicles may have lower exhaust CO and ROG reductions from oxygenated blends than earlier closed-loop vehicles. These lower reductions expected for the adaptive learning vehicles are not reflected in EPA's test data. The ARB is conducting emission testing of five adaptive learning vehicles to determine their performance levels.

Studies also need to be performed to determine overall ROG emissions impact. Modeling studies need to be undertaken to determine the effect of increased NO_x emissions on ambient levels of NO_2, PM_{10} and ozone. The SCAQMD, ARB, and EPA will analyze the air quality effect of an oxygenated fuel program in the Basin prior to moving forward with any proposed regulations mandating their use.

COST EFFECTIVENESS

In the Colorado Oxygenated Fuels Program,in which 8% MTBE captured a 94% market share with ethanol accounting for the rest, the estimated dollar per ton cost of CO reduction was calculated. This program costs ranged from $154/ton (central estimate) to $543/ton (upper-board estimate) for an 8% CO reduction and $112/ton to $395/ton for an 11% CO reduction. The increased cost on a per gallon basis was $0.0046/gallon (central estimate) to $0.0159/gallon (upper estimate). The estimated total household cost was $0.868 (central estimate) to $2.97 (upper estimate).

OTHER IMPACTS

According to the Colorado data, fuel economy for catalyst-equipped vehicles increased by 1.3% for MTBE blends, and by 0.3% for ethanol blends, but decreased by 0.2% for the methanol blend, Oxinol. Non-catalyst vehicles changes in fuel economy when using oxygenated fuels ranged from a decrease of 0.3% for ethanol blends to an increase of 0.2% for methanol (Oxinol 50) blends. MTBE blends showed no change. Overall, catalyst and non-catalyst vehicles exhibit no appreciable change in fuel economy from the use of oxygenated fuels.

REFERENCES

United States Environmental Protection Agency. 1988. Technical Report: Guidance on Estimating Motor Vehicle Emission Reductions From The Use of Alternative Fuels and Fuel Blends. Emission Control Technology Division, Office of Mobile Sources, Office of Air and Radiation, U. S. EPA, Ann Arbor, MI. January 29, 1988.

Colorado Air Quality Control Commission. 1988. 1988 Oxygenated Fuel Program: Annual Report to the Colorado Air Quality Control Commission. May 19, 1988.

Control Measure CM #88-T-8 Time and Place Control Measures

This is a new contingency control measure oriented toward specific control measures at specific times and places. The control options currently being contemplated include:

- Noontime starts of summer work days
- Noontime starts in the coastal/central areas
- Disincentives for vehicles in business areas
- Emergency plan measures required for forecast Stage I episodes
- Shutdown of non-essential services during forecast Stage I episodes
- Prohibition of single-occupant vehicles from entering the freeway system
- Provision of free bus ride during summer
- Banning organic solvent use on forecast Stage I episodes

The feasibility and potential impacts on air quality of these type of measures will be further examined in the next few years.

MODIFICATIONS TO APPENDIX IV-G
TRANSPORTATION, LAND USE, AND
ENERGY CONSERVATION MEASURES

TRANSPORTATION, LAND USE AND ENERGY CONSERVATION MEASURES
SUMMARY OF CHANGES TO DRAFT APPENDIX IV - G

The following changes have been made to the draft Appendix IV-G since its release on September 9 1988.

Executive Summary

- The Executive Summary and the remainder of the Plan have been updated with information from the latest drafts of the Regional Mobility Plan, the Growth Management Plan and the Regional Housing Needs Assessment.

- A significant change was made in the size of the total financial package for the preferred RMP strategy. This package now contains capital expenditures of $44 billion of which $21 billion has been identified as available (Constrained scenario). The previous figures were $42 billion and $13 billion respectively.

Chapter I. Introduction

- The implementation section of the introductory chapter was amended to include a reference to on-going funding of transportation-related air quality planning from Caltrans, FHWA and EPA.

- Also in the same section, use of the phrase "local government ordinances" is interpreted to include all regulatory tools at the disposal of local governments to achieve trip reduction targets.

Chapter II. Transportation Control Measures

General:

- The number of Transportation Control Measures decreased from 26 to 25. Highway Electrification and Automation, for which there were no assumed emission reduction benefits for the next twenty years, was moved to further study. The remaining measures were renumbered.

- A cover sheet summarizing common information was provided for the following groups of interacting transportation measures:

  Alternative Work Schedules and Locations,
  Mode Shift Strategies,
  Goods Movement, and
  Paved and Unpaved Roads and Parking Lots.

  Items, such as implementation assumptions, transportation indicators, and emission benefits, have been moved to the respective cover sheet for each group, and no longer appear in measure texts. This was done to prevent the tendency of the reader to duplicate benefits and to remove ambiguities related to span of implementation for Tier I.

- Changes to individual measures are summarized below:

1a. Alternative Work Schedules and Locations:

A new control method has been added requiring SCAG to establish an outreach program to promote awareness of growth and mobility issues and possible solutions. A corresponding bullet has also been added to the commitment schedule matrix.

1b. Telecommunications:

The control method requiring local ordinance on satellite work centers was deleted.

The following were added:

a. specific inclusion of work at home and part time telecommuting,

b. request for local government support in zoning ordinances for reasonable home occupations,

c. language allowing employers flexibility in choosing appropriate combination of trip reduction strategies based upon their individual circumstances, and

d. recognition of need for research on net energy use impacts of work at home.

2a. Additional steps were added to Control Methods to gradually decrease the applicable size of employer from 100 to 25 employees.

2c. A new control method was added requiring a vanpool tax credit, inclusion of vanpooling in local ordinances, and preferential parking privileges for vanpools. The new control method was also added to the commitment schedule matrix.

2e. Analysis of local applicability, costs and consultation with affected parties has been emphasized.

2f. The amount of needed High Occupancy Vehicle facilities, as called for by the updated RMP draft, has changed from 983 lane-miles to 1285 lane-miles.

3a. Under Control Methods (text) the ban on trucks during peak periods has been changed to restriction.

New sections on Implementation Issues and Other Impacts have been added for consistency with other measures.

4. Metering of all 600 freeway ramps is now under Tier I actions to be implemented during the first five years. The synchronization of 8000 signals and channelization of 500 intersections continues to be split 25% in Tier I and 75% in Tier II.

6. On the commitment schedule matrix, the check (###) on zoning has been removed. Checks have been inserted on business licenses and on lease agreements.

7. The same matrix change as on measure #6.

8. The same matrix change as on measure #6. A check for general plans was added.

   In the Control Methods section under the Ground Access Improvement Plan, the last point now includes incentives for provision of clean fuel-burning private airport shuttle/paratransit services.

12a. The title of this measure has been changed from Storage and Movement of Fine Particulate Materials to <u>Paved Roads</u>.

   Trucks will be required to maintain the distance between the top of the load and the top of the truck bed sides;

   By January 1, 1990, local governments will be required to adopt a "construction carryout" (soil transported from construction sites to paved roadways by vehicles) ordinance which requires the installation of truck wheel washers at the entrance of constructions sites; the access road to be paved; and the developer of a construction site to clean up the public roadway if necessary.

   By January 1, 1990, local governments will be required to adopt a "vehicle entrainment" (soil transported from unpaved areas to paved areas) ordinance which requires either the paving, curbing or vegetative stabilization of the unpaved areas adjacent to roadways where vehicles could potentially drive.

   By January 1, 1990, local governments, Caltrans, and the sanitation districts will be required to begin allocating resources to implement the vehicle entrainment ordinance for the areas for which they are responsible and for storm water control.

12b. A menu of control options has been developed for use on unpaved roads and areas where it is demonstrated that paving is not the most cost effective method due to low vehicle miles traveled, or where paving will impact water absorption rates, drainage patterns, and the amount of surface run-off or cause some other significant environmental impact. This permits the jurisdictions to

tailor the ordinances to reflect the characteristics of the areas.

13. The title of this measure has been changed from Freeway Capacity Enhancements to Freeway and Highway Capacity Enhancements.

Control Methods in the summary are reformatted to conform to the HOV facilities measure (2f).

Construction of facilities has been changed from 800 lane-miles to 1840 lane-miles to reflect coverage of highways as suggested by the change in the title.

15. The Implementation Assumptions section revision acknowledges the differences in the assumptions made in this measure (5.5% passenger vehicle fleet penetration) versus SCAQMD Appendix IV-A p. II-2 (40%, inclusive of other clean fueled vehicle penetration).

Chapter III. Land-Use Control Measures

17. (Formerly 18.)

The state Housing and Community Development Agency abbreviation was corrected to read "state HCD" instead of "state HCB".

The Control Methods summary and text have been modified to be consistent with the latest draft of the Growth Management Plan, to add emphasis on attaining a subregional level of job/housing balance.

Further in the same section, roles of agencies, such as Southern California Association of Governments, County Transportation Commissions, Air Quality Management District and State Housing and Community Development are spelled out.

Chapter IV. Energy Conservation Control Measures

18a. (Formerly 19a.)
A new paragraph has been added to the Implementation Issues section, stating that the wide variance in the degree of prior local government efforts in implementing energy conservation should be considered.

18b. (Formerly 19b.)
In the Control Methods section, the first point now relates to solid waste from all sectors, not just from the residential sector.

A 10% tax credit was added for industries utilizing recycled material.

The Background and Regulatory History section provides an update on AB 3298 (vetoed 9/23/88), and SB 188 (provides the above stated 10% tax credit.)

The Other Impacts section adds a paragraph to describe the impact of paper de-inking and recycling process on wastewater generation.

18c. (Formerly 19c.)
In the Control Methods section, the requirement for the California Energy Commission to enact mandatory commercial sector energy building standards has been deleted because they have already implemented it.

Under Implementation Assumptions, the fuel consumption reduction target has been doubled to 30%. Consequently, the NOx emission reduction targets have increased from 6 tons/day to 11.57 tons per day.

More background information has been provided on CEC analysis of energy efficiencies and reduction targets for fuel consumption.

Chapter V. Air Quality Benefits

o The air quality benefit calculations have been updated to reflect changes to control measures. The change was negligible.

Chapter VI. Methodology

o Information on the number of intrazonal trips as a percent of interzonal trips has been provided in the methodology section. This was necessary because the trips reported in the Regional Mobility Plan do not include intrazonal trips, while they contribute to emissions and are included in the Air Quality Management Plan calculations.

Chapter VII. Monitoring (Formerly Future Study Issues Chapter.)

o The Monitoring section has been revised based on discussions with EPA, ARB and SCAQMD and is now incorporated as a separate chapter. The monitoring section has not been changed since the Executive Committee reviewed the document on November 3.

Chapter VIII. Conformity

o The Conformity section has also been revised based on discussions

with EPA, ARB and SCAQMD and incorporated as a separate chapter. The conformity section has been modified, as follows:

a. A five page summary has been added which describes the federal requirements for conformity, the policies and objectives of the conformity process, and the conformity review process.

b. A table has been developed which specifies the conformity criteria for each component (General Development, Transportation, Wastewater Treatment, and Local Government Implementation) based on input from SCAG Environmental Planning and Transportation Departments Staff, EPA, ARB, the Transportation and Communications Committee, the Planning Directors Committee, the Energy and Environment Committee, the Community Economic, and Human Development Committee, and the AQMP Working Group.

c. The A-95 Clearinghouse minimum criteria for projects that are considered regionally significant has been attached, and the definition of a major capital expenditure will be developed to distinguish which projects are subject to conformity review.

Chapter IX. Future Study Issues

The Future Study Issues chapter has been revised and expanded. Now there are five sections.

o After moving Monitoring and Conformity to separate chapters, there remain the sections on Additional Measures, Cost/Benefit Analysis and Air Quality Elements. The Highway Electrification and Automation measure has been moved to future study under Additional Measures section.

o Two new sections have been added to the Future Study Issues Chapter. One describes the task force process and the other describes a menu of potential Time of Day, Seasonal and Place controls.